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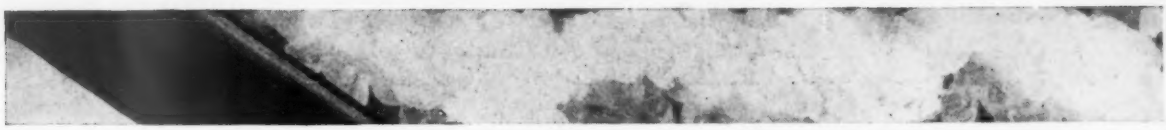

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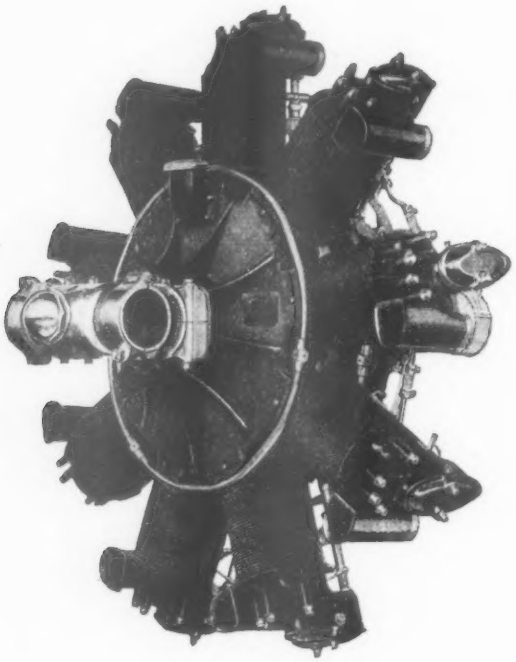

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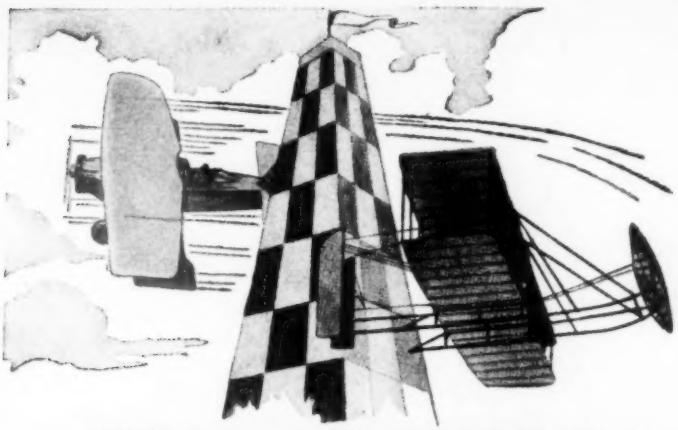

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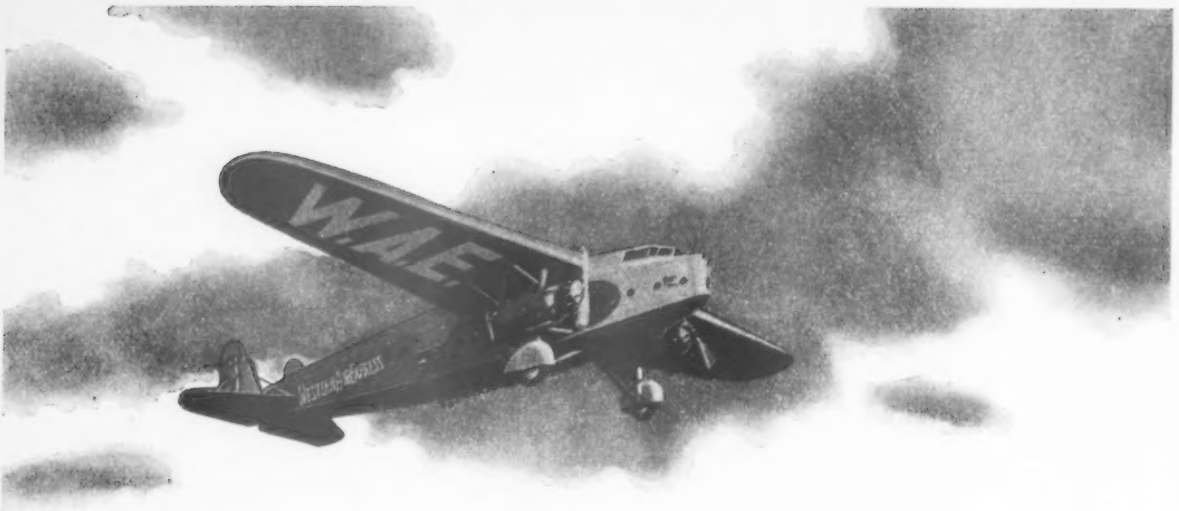

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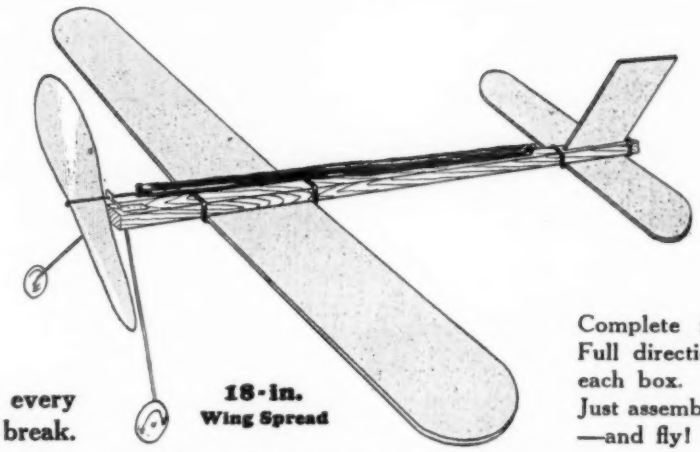

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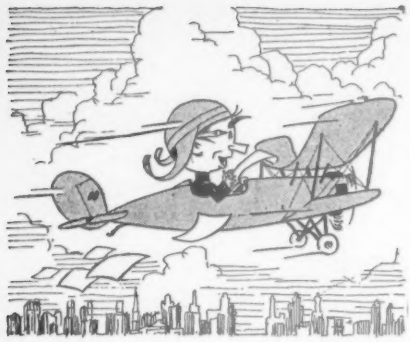

An Airy Chat With the Editor

FOR the time being, let there be quiet on the Western Front. All the fighting we hear and read about occurred in France. We forget sometimes that our air heroes have battled for their countrymen in other neighborhoods. After all, to the pilot with an enemy on his tail, he's not concerned what land he's flying over. He wants air and lots of it. The further he can get away from land, the better he likes the war.

This month we're offering a true story of what the marines have to put up with in Nicaragua. The Sandino bandits were a nasty bunch, running wild and roughshod over their native hills. It took our boys to make them behave, and devastating bombs dropped from the lower wing of a Vought Corsair helped the cause along.

* * *

DID you know that American soldiers were stationed in Siberia during the World War? Their duty was to keep the revolutionists from destroying the important trans-Siberian railway. A member of the flying unit stationed there was in our office recently. He had no exciting story to tell about his experiences. His flying was chiefly patrol work.

It seems that the true war stories we have been running have aroused considerable interest among war flyers from all over. Many have sent in some excellent stories of their experiences. Many others have just told us about their various skirmishes with enemy aircraft. But the net result is that POPULAR AVIATION has some great war stories in line for future issues.

* * *

JOHN B. RATHBUN is an old timer in aviation and when he tells us that aircraft design has been at a standstill for 15 years he knows what he's talking about.

At various times other old flyers have written to us bemoaning the inefficiency of modern aircraft—but we dismissed their ideas as "old fogey." When a prominent designer and scholar such as Mr. Rathbun insists that aviation has pulled a Rip Van Winkle stunt—it's time to listen.

Our readers may not all agree with him in his article this month—but we all must recognize the merit to some of his points. In particular, we must admit that the present day airplane isn't much easier to handle than it was 15 years ago—and it hasn't come down much in price. It still is cheaper to buy a house and lot, than a first-class family airplane.

Read Mr. Rathbun's articles carefully. Analyze his comparisons between the old and the new in aircraft and don't hesitate to express your own views on the subject. Write Mr. Rathbun personally, care of this magazine.

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J. Don Alexander, Dealers' Sales; Louis Bleriot, French Activities; R. J. Goodman-Crouch, Engineering; Sherman Mills Fairchild, Aerial Photography; Warren Irving Glover. Air Mail; Louise Thaden, Women's Activities; Charles Sherman Jones, Flying Schools; Alexander Klemin, Aerodynamics and Structures; Emory S. Land, Aviation Safety; B. Russel Shaw, Airports.

CAPT. PURCELL is one of POPULAR AVIATION'S most welcome contributors. We open his original manuscripts with ill disguised enthusiasm and a stamp of approval handy.

This month his article is right up to his usual standard. The *Superstitions of a Pilot.* That's hard to believe—these intrepid men of the skies—who pioneer their way through unknown dangers—are just like the rest of us. They have their silly fears and superstitious inhibitions just as you and I.

According to Capt. Purcell, one of the superstitions of the flyer is that a woman passenger bodes no good. At that, how many women transoceanic co-pilots arrive safely at their predetermined destination?

Capt. Purcell has a crackerjack article promised for the next issue. He tells what he thinks about women flyers—and he sure lays it on thick. Capt. Purcell dared us to publish the article. We should worry—he wrote it, and so we'll get the blame.

The author recommended that we lock ourselves away for a few months in a bullet proof, woman proof hideout after his article comes out. But nothing doing! We'll publish it next month and report at our regular desk just as usual. Yes, sir, we'll stick to our guns—and they'll be in a mighty handy drawer.

Just to even up the score, we'll keep Capt. Purcell's latest address easily available for anybody who wishes to take a scribbled pot-shot at him.

* * *

THERE was a tremendous call last month for free plans on the Fokker Amphibian model designed by Ott. We're doing the same thing this month. If you want to build a neat rocket model—and it sure is a beauty, we've seen it—just write in for your free, full-sized plans.

Next month we will probably present Ott plans on a Travelair Mystery Ship. There were so many requests for this particular model. Mr. Ott has also promised plans on a model power boat, not strictly aviation, but it will be fun and a change for model builders.

* * *

WILLIAM CROZIER of Calgary, Canada, is peeved at Louise Thaden for conveying the idea that one dare not venture into Canada in a ship equipped with wheels.

Our reader points out that the air mail flies every night in the week, and wheels, not skiis, are used.

"Aw, well, what's the use of finding fault," concludes Crozier, "but it made my blood boil to read Mrs. Thaden's recent comment, and I can assure you that I never miss an article. She says, 'Conditions up there are quite different from ours down here.' They are in two respects: your gas doesn't cost you quite as much as ours does, and we can go and buy a bottle of Scotch and drink it without fearing the interference of dry agents (which is comforting, I can assure you).

"Well, no offense meant, anyhow I hope you don't get sore at this. Even if you do, it won't stop me from reading your magazine. I hope Mrs. Thaden sees this."

Nobody's mad, Bill. Have a good time and say what you plase. Mrs. Thaden has already read what you wrote and has a word or two to say on this subject in her own column.

* * *

SEVERAL readers are puzzled on the subject of airplane noise. What is it that causes all the rumpus—the motor or the propeller? The answer is, both. There is still some question about

(*Continued on page* 54)

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A magazine for everyone interested in Gliders—Lightplanes—Models

Volume 8 MARCH, 1931 Number 3

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A SKIRMISH with

In action with the Marines in Nicaragua

Eighty-four Marines are surrounded by an overwhelming horde of murderous bandits. How Major Rowell and his daredevil squadron came to their rescue, fearlessly facing the deadly "CHULA" guns, is a true stirring adventure that will make your blood tingle.

SIX HUNDRED Nicaraguan rebels had surrounded the American garrison of eighty-four men at Ocotal. Rifles cracked intermittently. Now and then a machine gun rattled.

The Marines had taken refuge in an old adobe house, which was already riddled with bullets. The Devil Dogs had only one machine gun. Ammunition was getting low. The battle had started at 1 o'clock in the morning, when the rebels had made a surprise attack, and the men were worn with hours of hard fighting.

On top of that, the besieged Americans were thirsty and in danger of getting even thirstier, for the Nicaraguans were attempting to destroy their water supply.

To the Marines, trained and hard-boiled fighters as they were, the outlook appeared anything but rosy. Because of the almost impassable mountain roads and jungle-overgrown trails, it would take the nearest ground troops five days to march to their aid. And five days would be too late.

Major Rowell, commander of the American Air Force in Nicaragua for two years. For his conspicuous part in the campaign Major Rowell has received three decorations, including the treasured Distinguished Flying Cross.

Two of our flyers, Lieut. Hayne D. Boyden and Chief Marine Gunner Michael Wodarczyk, were making their daily air patrol when they approached Ocotal that same afternoon. Boyder did not hear the rifles below. The roar of his motor drowned them.

Circling the outpost, he observed that the streets appeared deserted and wondered why. He landed to investigate and it almost cost him his life. A friendly Nicaraguan screamed a warning to him, and he succeeded in taking off, with bullets whistling through the wings of his plane. Boyden and Wodarczyk lost no time in getting back to headquarters at Managua with a report of the besieged garrison's plight.

There was only one way to save the Ocotal garrison. That was by air attack. We had five old D-H planes and were eager to go. It was our first air fight in Nicaragua. We "revved" up our motors and took off. Climbing rapidly, we headed in the direction of Ocotal.

Below us stretched a tropical vista of grandeur and beauty. High mountain ranges mantled in swirling mists, deep shadowy canyons, and streams winding away toward the ocean like silvery ribbons. But the beauty of the scene masked all kinds of hidden dangers should we be forced down.

Past the smoking volcanoes of the Cordilleras, and over the mountain wilderness, we sailed amid thunder storms. There were no places to land, in case of motor trouble. The slopes below were rugged and the jungles almost impenetrable.

Delayed by the thunder storm, it was nearly 3 P. M. when we reached Ocotal. At an altitude of 2,500 feet we circled the town to reconnoiter. We had arrived none too soon. The Sandinitas were preparing to attack. Having located the attacking forces, we zoomed down at them, opening fire as we came within range.

Our machine guns continued to pour steady streams of bullets into the surprised rebels as we swooped close to the ground. It was their lives or ours!

We were in close formation, and they concentrated their fire on us when we closed in for the assault. But luck was with us. Although our planes were hit repeatedly and bullets zipped unpleasantly near our heads, none of us went down.

THEN we began to release our seventeen-pound bombs. The result was devastating. Accustomed as they were to the aerial attacks of Mason and Brooks (two young Americans who had been flying for the natives in their revolutionary war), the Sandinistas had never dreamed we could do so much damage. For Mason and Brooks flew two old Swallow planes, without bomb racks or machine gun mounts, and used only home-made oil can bombs. In spite of their courageous efforts, they had done little to inspire fear in the rebels.

Now the Nicaraguans saw for the first time just how destructive planes could be. Effects of our attacks were plainly visible. The ground was strewn with the dead and dying. Houses, in which they had taken refuge, were demolished. Groups were in stampede.

One incident I remember particularly. Four men were trying to get away with a burro loaded with loot. A pig was running across the road in

XUM

REBELS

by MAJOR ROSS E. ROWELL
Commander of the American Air Force

A forced landing meant capture and certain death. What happened to Lieut. Thomas and Sgt. Dowdell, and the futile efforts of a rescue party, make a true story you cannot afford to miss.

Illustrated by H. R. Bollin

As we dived down on them with motors roaring, they began shooting their "Chula" guns. It was a 45 minute fight, and came near being my last.

THE Marines had been ordered to find Sandino and bring him in.

It wasn't nearly as simple and easy as it sounded. The jungles, with their malaria, vicious insects and other tropical perils,

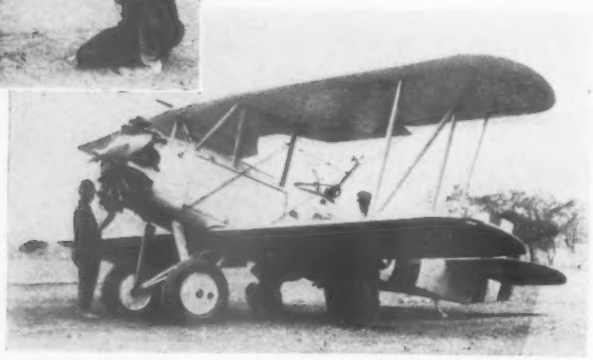
front of them. Then one of my bombs struck! When the smoke cleared away, the pig, the burro and the men were all heaped together.

For forty-five minutes we bombed the enemy and raked his ranks with machine guns. The Sandinitas were completely routed. Some have estimated the loss to the rebels at three hundred. Certainly there were a hundred casualties. We had saved the besieged garrison from annihilation!

But although we had routed Sandino's forces at Ocotal, our troubles for the day were not ended. Our five D-H planes were low on gas and an hour and a half from our base at Managua.

The storm, which we had managed to skirt on our way to Ocotal, closed in on us. We tried to dodge it by flying west toward the Gulf of Fonseca, but it was not to be evaded. Finally, in desperation, we bucked the blinding rain. Two planes were forced down at Leon, but they landed without mishap and returned to Managua on the following morning.

Thus ended the first episode of our conquest of Sandino. Other adventures were soon to follow.



Above, loading bombs in preparation for action in Nicaragua Right, grooming a Corsair plane for a trip to the front.

were one reason. The almost impassable mountain trails and their ambuscades were another.

To the air force fell the task of finding *El Chipote*, Sandino's mythical stronghold. It was while on a reconnaissance patrol for this purpose that Lieut. Earl A. Thomas and Sergeant Frank E. Dowdell, observer, lost their lives.

Accompanied by a second plane, piloted by Gunner Wodarczyk, they were flying low, about four miles north of Quilali, when suddenly the leaders' plane began to descend.

The plane's wings waggled furiously —a signal of distress. Apparently conked out!

Wodarczyk whirled around and gave his ship full throttle in the direction of the falling airmen. Lieut. Thomas succeeded in setting the plane down in a little clearing in the jungle. Wodarczyk saw the machine crackup and saw the two flyers jump out. Their ship burst into flames almost immediately.

Wodarczyk dropped them a map and hastily flew to Jicaro, the nearest garrison, where he dropped the message. From there twenty-five Marines were at once dispatched to rescue the fallen aviators.

This small rescue party was surrounded by two hundred or more Sandinistas and one of the bitterest engagements experienced by the Marines in Nicaragua ensued. Some of the native militiamen who were acting as guides were killed, but the Devil Dogs managed to cut their way out with hand grenades. They returned to Jicaro, where a second column of two hundred Marines was organized.

With an airplane convoy, it began its slow movement over the muddy mountain trails. Twice the airplanes thwarted attacks. Finally the Marines reached the place where Thomas and Dowdell had crashed. They found only the burned wreck of the plane.

A native told them the remainder of the story. The flyers had captured two natives and had forced them to cut a path through the tropical underbrush with their machetes. Suddenly one of the natives wheeled, and, with a vicious swing, cut off Thomas' right arm. Dowdell killed the native, but, during the melee, the second native got away. In a short time he returned with a band of Sandino's men. They surrounded the flyers. Thomas and Dowdell stood them off until their ammunition gave out, and died fighting.

This unfortunate incident caused us to believe that Sandino's stronghold was located near the spot where they fell. We concentrated our search on this district and the day before Thanksgiving I was rewarded by finding *El Chipote*.

The fortification was situated at an altitude of 3,000 feet on a mountain a few miles from where the two flyers had fallen.

Sandino had fortified it with machine gun emplacements, trenches, and all of the other military protections of like nature. Flying over the enemy's refuge for reconnaissance purposes, our planes were greeted with heavy rifle and machine gun fire.

It would have been easy to bomb *El Chipote* then, but we waited, because the Marines were ordered to get Sandino and bring him in. However, we did return their fire and a hot fight resulted.

ONE incident of the fight was a duel between Sergeant Albert Munsch and one of Sandino's Indian machine gunners. Munsch played with the Nicaraguan gunner for some time and his plane was shot full of holes. Fortunately, none of the Indian's bullets struck a vital spot.

Our bombs were all gone and when I dived in to call Munsch off, the machine gunner riddled one of my tires and I made a most ungraceful landing when I got back to Ocotal.

With the discovery of *El Chipote*, plans were formulated for the attack, which was to be made by an expedition of Marines, supported by airplanes.

One hundred and forty men and 200 pack animals were sent from Matagalpa and another column of sixty men and 100 animals from Telpaneca. They were to join forces at Quilali.

But nature had placed almost insurmountable obstacles in the way. Where there were trails, they were overgrown and bottomless with mud. It was impossible for the columns to progress more than a few miles a day and they were constantly exposed to ambushes.

This was the opportunity for which Sandino had long waited. With a band of 700 or 800 men, he attacked the column from Matagalpa at a twist in the trail, almost within sight of Quilali. Above the trail there was an almost impenetrable underbrush. Below it was a raging tropical stream.

Six Marines were killed and several wounded in the first few minutes of the battle. Capt. Richard Livingston was one of those wounded. In all our men suffered twenty-eight casualties.

There was only one way to rescue the wounded. It was to bring them out by airplane. Lieut. C. F. Schilt volunteered. He not only succeeded in carrying out the wounded in spite of perilous landings, but brought the Marines needed supplies and medicines and a new commanding officer to take Livingston's place. For his courage and remarkable skill he was awarded a Congressional Medal of Honor.

In the meantime, our planes kept Sandino in check. He withdrew to *El Chipote* and we received orders to attack his stronghold while our ground forces reorganized.

The time had come to deal a telling blow to the bandits. Our old D-H planes had been replaced with new Vought Corsairs, Navy two-seaters. We only had four of the new ships set up, but the situation demanded action.

Our attack on *El Chipote* took place about February 1. It was one of the most decisive blows in crushing the bandits. They never dared fire on us openly after that.

Loaded with fifty-pound demolition bombs and fragmentation bombs, our four planes swooped down on Sandino's unsuspecting army, which had gathered at the mountain stronghold. It was defended with machine guns and riflemen.

Sandino, to bolster up the courage of his followers, had told them that he had a weapon absolutely deadly to airplanes. It was supposed to be the invention of an Indian genius and was known as "the Chula gun." The gun was really a small trough through which rockets, with sticks of dynamite attached, were shot into the air.

As we zoomed down on them with motors roaring, they began shooting their "Chula guns." The pyrotechnical display was wonderful and although the air waves caused by the dynamite explosions in the air rocked our planes, we were unhurt.

It was a forty-minute fight and came very near being my last one, although not from enemy bullets. We were driving home our attacks and Sandino's defeated army was fleeing in all directions when my motor began missing.

As it coughed and sputtered, I swung the ship toward our lines and began working a hand pump desperately. There was no place to land. Three times the motor threatened to quit

(*Concluded on page* 62)

XUM

What Started the War in the Air

THE first allied aviator to shoot at a German flyer was severely reprimanded by a British general Capt. H. Weir Cook, British war aviator and director of a flying field at Indianapolis, revealed this fact recently.

"Airplanes were used only for observation purposes at first and when enemy fliers passed each other they waved their hands or made signs to indicate the war wasn't a personal matter with them," Capt. Cook said.

"One of the British aviators took his revolver along with him on a flight one day and took a potshot at a German. He was 'called on the carpet' by the general and warned that such unsportsmanlike conduct would not be tolerated. Other allied aviators took guns along with them, however, and finally one of them killed a German with a shotgun. That started aviation warfare."

Lindbergh's New Speedster

The Lockheed Sirius with its wheels "tucked in." This new plane is claimed to be the fastest commercial airplane in world.

WITH a speed of 238 miles an hour, Colonel Charles A. Lindbergh is expected to have the fastest commercial airplane in the world. A new wing for his Lockheed Sirius will be substituted for the present one on his monoplane. During a test flight of the new wing on a Sirius similar to Col. Lindbergh's, the flight record from Los Angeles to San Diego was broken. The 107-mile trip was made at an average speed of 192.6 miles an hour.

It is pointed out that the test plane used here had only a 420-horsepower motor, while Col. Lindbergh has a 605-horsepower Wright Cyclone engine installed in his plane.

The new wing allows the landing gear to fold up and it is said by engineers that 28 miles an hour is added to the speed of the craft.

Air Travelers Are Superstitious

SEVERAL aviation concerns report that their cash boxes are light when Friday falls on the thirteenth of the month.

A check of receipts by days reveals that there have been fewer rides on Friday than on any other day of the week, and when Friday falls on the 13th, airplanes are completely shunned.

Professor Designs Cheap Light Plane

THE tiny all-metal plane shown in the photograph was constructed behind the locked doors of a hangar, in absolute secrecy. When it was completed the bets were three to one that it wouldn't fly. It not only flew successfully, however, but it proved its complete air-worthiness in recent tests conducted by a number of skilled pilots.

Conceived by Mr. John Akerman, professor of aeronautics at the University of Minnesota, and airplane designer of considerable note, this craft is 22 feet 8 inches long, with a wing spread of 30 feet. It stands but 4 feet 9 inches in height. The ship is rather light and can be built at a reasonable cost without employing inferior, cheap materials.

One can step right into it without climbing as one must in most planes. The nose opens up to permit entrance, then it can be closed again. One passenger can be seated side-by-side with the pilot.

There are several distinct aerodynamic advantages in having the motor in the rear, and in addition, the pilot is not troubled with "oil in the face" and the threat of carbon monoxide poisoning is removed.

The Birth of the Early Birds

Old-Timer's Club Started in 1928

"HEY, Bill," shouted the veteran airman through the connecting tube, to his companion ahead, "we're early birds this morning. Old Sol isn't even up."

His companion turned, and from one corner of his mouth came these words, "Ye-ah! Gotta hand it to the early birds. They catch the worms."

The man behind was quiet a moment; deep in study. The man ahead looked over the side—down, down, down, into the awful gash in the earth's bosom—the Grand Canyon.

"Hey, Bill," the first speaker again put his mouth to the tube. "That's a swell idea you gave me—Early Birds. That's what we are. We'll organize a club when we get to L. A. Just all old timers! What d'ye say?"

The man ahead turned, leaving the ship fly at will. He looked at his begoggled companion. Then he spoke, but not into the tube. The roar of the engine silenced his words. A bit sheepishly he took up the tube.

"I said that's a grand idea you got. We'll do that very thing!"

And the seed of a national organization sprang into life and began to grow.

This was in the year 1928. Today its members are not many, but like those of the Caterpillar Club, very select. This is because of the peculiar requirements.

The "Early Birds" consist wholly of those men who were in the flying game prior to the year 1916—"Pioneers of Aviation," you might call them. An effort is being made to bring to light the names of all those eligible who have not as yet associated with the organization.

Every new applicant must submit a complete account of himself, his exploits and past connections, before he is accepted into the brotherhood.

The most important objects in the organizing of this group are "to foster and preserve interest in the development of aeronautics, to promote the common welfare of its members through social and business intercourse, and for other lawful purposes connected with aeronautics." Another, and a pleasant one, is "to revive recollections and contacts for the various members."

These Early Birds, some out of the race, but still interested, desire to keep in touch with the game. A few names, selected at random, but with knowledge of their present fame and fortune, are given: Glenn H. Curtis, Brig.-Gen. B. D. Foulois, U. S. A.; Earl Ovington, B. R. Hassell, Marjorie Stinson, A. H. J. Fokker, and Giuseppi M. Bellanca.

Reader Uses Ford Motor to Power Craft

Above, Alvia Peters in his home-built ship. Left, the Ford engine mounted in the fuselage ready to swing a 6'6" propeller at 2,380 r.p.m.

ALVIA PETERS sent these photographs from Fortuna, Calif., to show us what can be done with a Ford motor and some brains.

In speaking of his design, Mr. Peters says:

"It is a two place side by side job that flies with a Model A Ford motor, and it is some rig! It is very slow on the landing and has a top of 68 m.p.h. It cruises at 50 in fine order.

"Its span is 36 feet and chord 67 inches. The ailerons are enough oversize so that there is perfect lateral control at the slowest speed."

Mr. Peters converted the engine himself and reports that it swings a six-foot prop 2380 r.p.m. "as long as you want it to."

How High Can Sounds Be Heard?

SEVERAL years ago, Camille Flammarion, the great French astronomer, ascertained the height at which sounds could be heard from a balloon. The following results of his observations may be of interest to readers of POPULAR AVIATION.

The shout of a man was heard plainly at an altitude of 1600 feet, the sharp note of a cricket at 2500 feet, and the croaking of frogs at 3000 feet.

At an altitude of 3,255 feet, the rolling of a cart and the voice of a man were audible. At 4,550 feet the music of an orchestra and the beating of a drum.

At 5,000 feet the crowing of a cock, and also the ring of a church bell and sometimes even the shouts of men and women were distinguished. Nine hundred feet higher still the report of a rifle and the barking of a dog could be heard. The noise of a railway train could still be heard at a height of 8,200 feet, and the whistle of a locomotive engine penetrated to an altitude of nearly 10,000 feet.

Smoke Pot Used as Wind Indicator

THERE have been all sorts of wind indicators in this country. A popular type abroad, however, is the smoke pot.

An oven is sunk at any convenient spot on the landing field. An underground pipe is used to keep the oven supplied with a special fuel that gives off dense white smoke.

As this smoke is released it naturally follows the wind direction and serves as an excellent marker. Furthermore, smoke is one of the best indicators of wind velocity and this smudge pot therefore serves a valuable dual purpose for the guidance of flyers.

Dense white smoke escaping from the oven.

Novel Instrument Latest Aid to Blind Flying

A NEW instrument, the design of which takes a hint from the bat, permits the pilot of an airplane, while landing in a dense fog, to determine at any instant his height above the ground.

The operation of the device is simple: it merely shoots a sound wave to the ground, catches it on the rebound and measures the time consumed in the round trip of the sound.

The instrument is called a sonic altimeter, and its operation is analogous to the method which supplies bats with their uncanny ability to avoid obstacles in their weird and seemingly erratic flights. It is generally assumed that the bat, while flying, emits a sound too high in pitch for human ears to hear, which is echoed back from the surface of surrounding obstacles, thus enabling the animal to sense the proximity of an object.

The "sonic altimeter" has a whistle which is blown at regular intervals by power from the engine of the airplane. With this is provided a means for catching the echo and, for altitudes greater than 50 feet, a dial on which the altitude may be read.

The dial indicator is very useful when the airplane is flown in the obscurity of fog or at night. The radio beacon, automatic pilots, the artificial horizon and other blind flying instruments make flight possible under conditions of no visibility. But the greatest problem is to land after finding the way to the fog-bound airdrome. This, it is believed, the sonic altimeter will now make possible.

A view of the sonic altimeter set up in the laboratory.

Having arrived over the airdrome, the boundaries of which are made known to the pilot by an electro-magnetic field, the airplane is brought down until the sonic altimeter shows that it is at a height of about 200 feet. The engine is then throttled or slowed down and the airplane is allowed to settle in a normal glide.

Here is where the "sonic altimeter" is called upon for its best service. The time interval between the whistle emitted from the airplane and the echo which is picked up by the pilot, is a measure of the height. As the airplane nears the ground this interval becomes shorter and shorter until, at a height of about four or five feet, the whistle and echo blend into one combined note. The pilot knows at this time that he can pull back on the stick and settle or "pancake" to the ground.

XUM

To Power *or* Not To Power

That is the question that confronted the PROVIDENCE GLIDER CLUB

says

ARTHUR L. LAWRENCE

The Providence Glider Club comparing a Waco glider with the Eaglet lightplane. Pilots Holihan and Daignault are at the extreme left, the author is 4th from the left.

A THOUSAND feet of tow rope was stretched out along a runway. I am seated in readiness in a Waco primary, the safety belt buckled securely around my waist.

A man holding a wing-tip see-saws the wing up and down as a signal to the automobile on the other end of the rope. The line tightens and the ship starts. Speed increases rapidly, and the glider climbs to 15 feet, when the rope goes slack while gears are shifted. Then comes a strong steady pull, and in the remaining 2,000 feet of runway, the car tows the glider to an altitude of 300 feet.

The car has reached the end of the runway. I sit up straight, nose the ship down, and pull the release cord. The rushing air makes my eyes water. What was a gentle breeze on the ground feels like a 40-mile gale at that altitude in a primary. "Bumps" are felt much more in a light motorless ship than in an airplane.

A good steep bank to the left and lots of left rudder rapidly bring the craft around 180 degrees. Flying down wind, the distance back to the starting point is covered in short order. Overshooting it several hundred feet, another left bank and turn is executed.

This latter is much more difficult; all the available rudder is needed and the ship has to be dived. As it comes around into the wind, however, the rudder becomes much more effective, and the radius of the turn is sharply decreased.

Flying over the heads of the crowd which had gathered around the glider before the start, I ease in for a landing some 150 feet in front of the starting point. Someone who has been timing the flight announces that 65 seconds have elapsed between the take-off and the instant the glider came to rest once more on terra firma. Sixty-five seconds in which all this took place. It seemed a full 10 minutes.

I have made many such towed flights and have reached the end of my rope, both literally and figuratively. After some 40-odd shock-cord flights at the Cape Cod Glider School, I began making straight towed ones at the local airport, using about 200 feet of the 1,000-foot coil of rope and getting some 20 feet off the ground.

I soon increased the length of rope to 500, the altitude to 50, and made "S" turns. Then for a long while 800 feet was plenty. My first 360 was nerve-wracking, because I felt as though I would never be able to turn out from the down-wind run and was worried over the idea of a down-wind landing. I just managed to get around and make a two-point landing — wing-skid and main skid.

FINALLY, one fine Sunday morning when the wind was blowing in the direction of the longest runway — some two-thirds of a mile in length — I decided to use all the rope and try for a record. The remaining 200 feet of rope was let out, and I climbed up rather dangerously, cutting loose as soon as I reached what I considered a safe maximum altitude.

Then I made a tremendous "S" turn, taking it leisurely and getting as much out of my altitude as I could. I sailed on easily, buffeted not too badly by the wind, and continued out over the airport proper. Over bushes and small trees I sailed towards another plot which was being prepared for addition to the flying field. The trees at the far end shielded the wind, and I got down into dead air. I dove, picked up plenty of speed, and made a perfect landing. Time, approximately 75 seconds; horizontal distance, 0.7 miles.

The author is seen demonstrating a towed flight to club members. A 200 feet tow rope is being used.

But auto-towing of primary gliders to relatively high altitudes and the climbing of them steeply do not make the safest sort of sport, even though exciting enough. I never make a long towed flight without thinking of what might happen were some of the flying wires, which have taken quite a beating in the last few months, to snap.

A total of over 130 glider flights of every description, however, have taught me a lot about flying, and as I see it, two excellent plans present themselves for future progress.

Our glider club numbers some 30 members, ranging in age from 14 to 41, who have had a varied amount of glider experience. By the time spring arrives, most of them will have qualified as glider pilots. Already we are talking over ambitious plans for the future. Two principal ones, either or both of which we expect to carry out, are as follows:

I. The purchase of an Eaglet or a similar light, inexpensive ship equipped with duals, and the hiring of a transport pilot to solo club members.

II. The procuring of soaring territory for club use and the purchase of a utility glider, trailer, etc.

I want to discuss the first plan, as it offers great possibilities for glider groups that are operating or planning to operate in areas where soaring terrain does not exist.

Recently, members of our glider club had a chance to compare the Waco glider with an American Eaglet.

ACCORDING to previous arrangements, Transport Pilot Dick Holihan and Armand Daignault, who are forming a flying club in a nearby city, flew their small ship one Sunday morning to the What Cheer Airport, where the Providence Glider Club, to which I belong, holds forth.

There isn't so very much difference in size between the tiny high-wing monoplane and the primary training

glider. The Eaglet actually has less wing area than the Waco, a shorter wing span, the same overall length, and, because of the cabane strut on the motorless ship, less overall height. The 30 horsepower Szekely engine, however, gives the Eaglet a cruising speed of 70 miles an hour and a top speed of 90. Yet it lands only five miles an hour faster than the glider — 25 air speed.

For a group of 30 glider pilots, the individual outlay for the purchase of such a ship would be very low. With glider experience, dual instruction time, and therefore expense, would be tremendously reduced. The operating costs for a ship of this type are only a fraction of similar costs on a usual two-place trainer.

But, to get back to the American Eaglet and what happened at the airport. Every club member was anxious to take a flight in the plane. Several were given short hops. As it was equipped with duals, and as I hold a student pilot's permit, on my flight I was allowed to take over the controls and fly the ship most of the time. It was the first time that I used the permit.

While at the stick, I tried to draw a comparison between flying the Eaglet and the Waco glider. With the exception of coming in for a landing, which requires a somewhat different technique, the Eaglet was easier to handle.

The longest possible towed glider flight that one can hope to make at the airport is of approximately two minutes' duration. If one is attempting a 360-degree turn, one has to climb the glider as rapidly as possible to gain the necessary three or four hundred feet of altitude, before the towing car reaches the end of the field.

Since it is always advisable to land into the wind, once one has decided to make the turn there is no time to waste. The turn must be executed rapidly, before too much altitude is lost. After making half of the turn, when the glider is traveling down wind, it takes a lot of rudder and some little while before the craft swings around to complete the circle. By that time the flight is about over.

As the wind velocity decreases near the ground, the glider has to be nosed down from about 30 feet to pick up speed for a safe landing. The stick is eased forward, but when a couple of feet above the ground, it is brought back fairly rapidly so that the glider skims along until it loses flying speed and settles to earth.

In a powered ship no particular time element is involved and one can fly leisurely. One has to use the stick more frequently for lateral control than in a glider, though only slight movements are needed to keep the ship in level flight. It is true that one does not feel keyed up to the high point of alertness, which is the sporting thrill to gliding. Nothing can quite equal the exhilaration of flying through space, seated out in the open, suspended from a wing and with no horse-power. But flying

(*Concluded on page* 53)

Italians Build Huge Biplane

LAST year, Caproni produced a giant plane, the 90 P. B., powered with six Asso 1,000 h.p. engines giving a total power of 6,000 h.p. This is the largest plane built in Italy and one of the largest landplanes in the world.

The Caproni is entirely of metal construction, high tension carbon steel tubing, being principally used. Duralumin is used for engine cowling, wing center sections, etc., while the fuselage and wings are fabric covered.

As can be seen from the photograph, the lower wing is larger than the upper. Ailerons are fitted on the lower wing only.

This plane, a bomber built for military purposes, can be easily transformed into a commercial plane. Its top speed is 130 m.p.h., with a range of 1,200 miles. The total weight is 45 tons.

New Wind Tee Swings with Slightest Breeze

THE chief trouble with the wind-sock is laziness. A snappy wind is required to rouse it to its sense of duty so that it can be seen.

This new wind tee has eliminated these objections. It is visible for a mile or so in the day time and can be easily seen five miles when illuminated at night.

The device is of all metal construction and is strong enough to withstand the highest wind, yet so delicately balanced as to be sensitive to a velocity of one mile an hour. For illumination

at night four lights are attached to the top of the supporting post. The tee can be equipped with neon tubes if desired.

In dimensions, it is 23 feet long and 13 feet wide. The fin and cross-arms are finished in pure white, bright yellow and vivid red, giving extreme visibility.

500 M. P. H. Airplane Being Built

CONSTRUCTION of aircraft which will fly 500 miles an hour at an altitude of 40,000 feet is entirely feasible, it is believed by the bureau of aeronautics of the Navy Department. Already, in Germany, an airplane capable of this super-speed is being designed and, when completed, is expected to make the flight from Germany to the United States in six hours at an approximate altitude of 40,000 feet.

"The theory which these Germans are said to be applying has long been recognized," Lt. W. S. Diehl, naval aerodynamics specialist, recently declared. "We have been aware for some time that at the higher altitudes more speed can be obtained with the same power than at sea level. The 'drag' on the plane at a given speed consequently is but one-quarter as great at that altitude, and the power required to propel the plane is therefore only one-fourth as much as needed at sea level."

The reasons why such a plane has not heretofore been built, although somewhat numerous, can be overcome, Lieut. Diehl stated. Some of the objections mentioned were discomfort to passengers and crew because of excessive speed and cold, the need of highly supercharged motors, and the problem of securing proper fuels to withstand the low temperature. The cabin of the German plane, in which it is expected to cross the Atlantic in six hours, will be air-tight, and the personnel will be provided with artificial atmosphere, it was explained.

XUM

Is It Possible to Fly on Whiskey?

ALCOHOLIC beverages can be absorbed by both the pilot and the engine, but the after effects are entirely different in the two cases. The engine can get away with gallon after gallon of the old 150 proof stuff without staggering or suffering with the "big-head," while the pilot becomes decidedly eccentric in his doings and sayings with only a small fraction of the drink.

Almost any engine of the high compression aviation type will wade through oceans of alcohol, including the denaturants and all of the other groceries added by the prohibition party. It is not critical regarding the aroma, year of vintage or the labels on the barrel—it just keeps on going as long as the gage shows 150 proof or better. Whisky, pure alky, gin, hootch, anything at all, just as long as the percentage of the alcohol stands above a certain mark. Beer, I regret to say, or even light wines, have no place on the engine's menu.

Now, when we disconnect the gasoline tank and connect a tank of alcohol to the carburetor, the high compression engine will run very well, notwithstanding the fact that a gallon of alcohol contains much less heat energy than gasoline. If the compression is kept above 100 pounds and the alcohol is well heated, you will be surprised to find how nicely and smoothly the engine will run and how the knocks and detonations that were so annoying with low grade gasolines disappear.

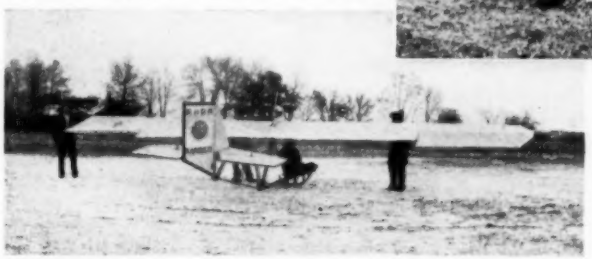
Raise the compression to 140 pounds per square inch, and the power obtained from the alcohol is still further increased with no more tendency toward knocking than in the first place. Even at 200 pounds compression the engine functions very well, while gasolines will go crazy at anywhere near this pressure.

Whisky, containing 40 per cent of alcohol, is a very excellent fuel from a purely theoretical standpoint, but unfortunately it is far too expensive. It forms no carbon, it does not dilute the lubricating oil, does not smoke, does not knock with an advanced spark and permits the use of the ideal and efficient high compression type engine.

This matter has been argued pro and con for many years in engineering circles, but the facts in the matter point to the very limited production of alcohol possible either now or in the future. It has been estimated that all of the farm acreage now in cultivation all over the world could not supply half the alcohol necessary for taking the place of the gasoline now being burned, hence there is not much prospect along these lines for the future unless we stop eating farm products altogether.

Home-Built Gliders Prove Successful

EVERY month we hear of new gliders being completed by amateurs in all parts of the country. Here are two of the latest—a Rhon Ranger built by Cedric C. Mattpres of Edgerton, Wis., and another primary type built by Donald Andrew, Newhall, Ia.



Above, Donald Andrew seated in his $60 glider. Left, the Rhon Ranger built by Cedric Mattpres.

Of his glider, Mr. Mattpres says:

"It was built from POPULAR AVIATION plans, and I am glad to say, it flies fine in spite of the fact that we are not yet experienced enough to make any fancy flights. It has been landed with the usual shocks of amateur piloting and the skid is the only thing which has been broken."

Mr. Andrew, in speaking of his glider, says in part:

"A friend of mine and I built this during our spare time. The most important point of the construction was the cost. The complete materials cost less than sixty dollars. Ordinary pine wood was used throughout. The wings were covered with a good grade of muslin and given three coats of dope. When completed the glider was tested and flew perfectly."

New Dirigible To Have Unusual Power Drive

THE final block tests of the power plants to be used in the new Navy dirigible "Akron" are of unusual interest. For the first time in an airship design, the motors are to be placed 17 feet from the propellers, which they will turn.

A radical transmission gearing had to be worked out for the eight engines of the "Akron." Instead of being located in separate gondolas hung on the outside of the ship, the engines will be lined up in an engine room along the keel of the dirigible and entirely inside the bag.

The propellers alone protrude outside the structure into the air, and it has been necessary to transmit the power from the engines through a shaft which extends through the dirigible's hull.

Each of the eight engines, with its accompanying gear transmission system, is to be subjected to a 310 hour continuous run to test the reliability of the new design. The only power plant tests comparable to this one are those employed on submarines.

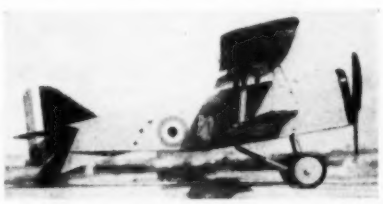
Maybach Zeppelin engines similar to those used on the "Los Angeles" have been chosen for the "Akron."

These motors are also unusual, as they are reversible and in an effort to utilize this flexibility a swivel device has been designed for the propellers so that the dirigible can be driven upward or downward, or at an angle, in addition to forward.

Foreign Reader Builds Attractive Model

ERNESTO TABIO of Havana, Cuba, recently sent us this photograph and a very interesting letter in which he says:

"I have been reading POPULAR AVIATION since 1928, and like it very much, specially the Model Department. I am Cuban, but I can read a little English and for that reason I look for articles written in plain English, as yours are.



An excellent amateur photograph showing the S. E. 5 model built from Popular Aviation plans.

"Last week I completed the model of the SE-5 Scout. I made this from the plans you published in the September issue with some changes of my own.

"Here in Cuba, there is no model activity to speak of. However, a friend of mine, who is also a reader of POPULAR AVIATION, has made some excellent scale models, and we both enjoy working from your plans."

The Pet Superstitions *of a* Pilot

by CAPT. CHAS. W. PURCELL

Among the many dangers a pilot must face is that of a hoodoo jinx. Capt. Purcell, an old Popular Aviation favorite, defines some *do's* and *don'ts* for superstitious pilots.

"WHAT'S that guy hot-footin' it back to the hangar for? Goofy?" asked the first mechanic.

"Nope, he ain't goofy. He just forgot his razor blade or his wife's sock, or something," said the second mechanic.

"Whadya mean his wife's sock? What the heck's that got to do with flying?" said the first ditto.

"You'd be s'prised, big boy. Don't yuh know, you poor punk, that these here cloud hoppers is the most superstitious saps in the world? That guy probably never goes into the air unless he has a sock or a washboard, or baby's shoe or something like that on 'im. Every one of them saps has some little thing to keep his luck."

The second mechanic spoke more truth than poetry. Flying has developed some of the goofiest superstitions the world—yes, I mean the whole world—has ever known.

I know a gink who is hopping a tri-motor and he won't kiss his wife before he leaves the house on a run because he once had a forced landing and he blamed it on the kiss. Another yahoo I know arrived at his home port one time and made fourteen landings all in the same flight. He dropped from the cabin window and made the superintendent's office in about four jumps.

"My God, I made that trip without my ring!" he groaned, as he flopped in a chair with perspiration sticking out in little bubbles on his white, yes, decidedly white brow. You see, his ring was the thing that enabled him to avoid all and sundry accidents.

This has always been a source of amusement to the author; this superstition of pilots. Some of these "Hollywood-romper" clad stick holders will even refuse to look at a picture of a crack-up, and if you want to give a lot of them "high-strikes" just wave a piece of a plane that crashed in their general direction. It means murder, and I don't mean perhaps.

DON'T Light 3 cigs on one match.
DON'T Fly over spot where washout occurred.
DON'T Wipe goggles before a hop.
DON'T Look over right shoulder while flying.
DON'T Climb into R.I. on wrong side.
DON'T Change clothing that was put on wrong in the first place.

What's wrong with this picture? Nothing . . . but the photographer has a dire fate in store for him, if he's superstitious.

Some of the big "don'ts" of superstitious flyers are: Don't light three cigarettes on one match. Don't fly over a place where a wash-out occurred. Don't wipe your goggles just before a hop. Don't look back over the right shoulder while flying. Don't change any wearing apparel that was put on wrong in the first place. Don't climb into the pit from the wrong side.

Some day you may see a nice looking young man all dressed up in knickers, with one golf sock on right and the other wrong. If you do, go on your way without appearing to notice. Don't crack a smile, or the said young man may "bop" you one.

While we're on this subject of "smiling at misery," it might be well for you to know that anyone who gets "bopped" by a man who is trying to hold his luck gathers unto himself a couple of black eyes, along with his bad luck, and this isn't superstitious—it's pure, unadulterated, cast-iron facts.

Here is one of the finest ways in the world for a sweet young thing to find out if her sugar daddy pilot loves her.

Little does this "peelot" reckon what's in store for him. The woman passenger is taboo, bad luck, according to Capt. Purcell.

Go out to a port and find a helmet that was worn by some gink who did a good job of cracking up a ship. If the ship was completely washed out, so much the better.

Take this so-called "crash helmet" to young sweetie, tell him it's a crash helmet, and ask him to fly with it. If he's a Peelot (not a fifteen-hour pilot), and he wears it, well the author will admit there is no Santa Claus, and this is a big gift on his part.

These crash helmets are shunned by most pilots, and the author isn't what you might call "crazy" over them. We have known motors to "conk," wings fall off, and ships wash out when there was a crash helmet in the pit. Of course, there's nothing in this superstition—nope, it's all in the imagination (so's your Aunt Ophelia!).

WE HAVE a very good friend who pulled out his handkerchief on the field one day and as he did so something else came out of his pocket. Everybody made a dive for it.

The author, being built close to the ground, got there first, and found that this very good friend of his had been carrying around a motor bolt from an old Jenny he had trained in during the war. It took about an hour of fast talking on the part of the crowd to get the story.

While flying at North Island in 1917 (I can almost hear some of the old timers trying to guess who it is) in one of the old "Dep" controlled Jennies, the aileron wheel came loose in his hands.

Having only just started flying solo he was rather embarrassed, and dove the ship into Spanish Bight. He missed the Bight and hit the sand strip and bounced along until he finally ended up on his back. He didn't receive a scratch,

(*Concluded on page* 57)

What Causes Noise in Airplanes

A NEW series of experiments on the elimination of airplane noises has resulted in the conclusion that the only positive known method of reducing the noise produced by the propeller is to decrease its tip speed.

Airplane propeller noise remains something of a mystery to scientists. Previous experiment has shown that elimination of airplane motor noise merely accentuates the propeller noise.

It is now agreed that one of the chief sources of sound on an airplane is the propeller. The principle by which the sound is produced is not clearly understood, but it is believed to originate in the pressure variations existent in a turbulent flow of air past the blades.

It was found that at some speed in the region from 0.7 to 1.0 the speed of sound, depending on the thickness of the propeller, the flow begins to change from the smooth-flow characistic of efficiency to the burbling type of flow which at low speeds occurs only at large angles of attack.

The air no longer follows the upper curved surface nearly to the trailing edge, but breaks away from the surface to form a region of violently eddying flow. In this region the greatest noise disturbance of the airplane propeller are now believed to originate. The fluctuations of pressure in this flow are converted into sound waves. In the model tests it was shown that the change in flow was accompanied by a great increase in the noise.

As the result of these and similar experiments, engine exhaust is now considered a secondary source of noise on an airplane.

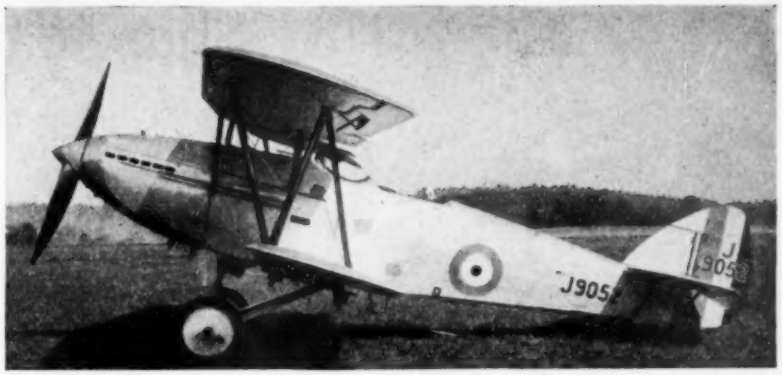
Air School Offers Scholarships

ON January first, Parks Air College announced five scholarships which will be awarded to students who enroll for training on or before February 14, 1931.

Four of the awards will give additional flying time to the winners, while the fifth scholarship gives a free master mechanics course to the successful applicant in the airplane mechanics course.

The winning student in the limited commercial course will receive an additional 150 hours of free flying—enough to obtain a Transport License. Two other awards, of 30 and 20 hours each, will also be given. In the Private Pilot's course, the winner will receive sufficient additional time to obtain a Limited Commercial License.

In addition to these scholarships, Parks will also employ as a Junior Flying Instructor one of their Transport students who completes his course between February 14 and October 1, 1931.



Latest Model English Fighter Travels 220 M. P. H.

THE Royal Air Force of Great Britain has recently ordered a large number of Hawker Fury and Hawker Hart planes.

All the single or two seater fighter planes of the Royal Air Force will be replaced by these planes, which are faster than the others. The Hawker Fury is capable of a speed of 220 miles per hour. The Hart with its bomb charge (it is a two seater day bomber) has a speed of 190 miles per hour.

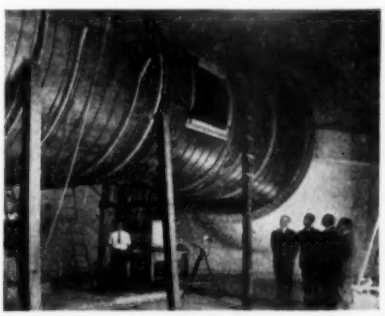
The design of the fuselage is based upon the use of steel or duralumin tubing in either square, round and rectangular sections. At the point of contact the tubing is squared or flattened, and connection is by means of flat plates and rivets.

The wing structure is characterized by the same simplicity of design as the fuselage. The spars consist of two one-piece booms interconnected by a web. The booms are rolled to shape in one piece from hardened and tempered steel strip, and rivetted to the web.

The flat side greatly facilitates rib attachment, while the fact that the booms are in one piece minimizes the extent of riveting. The ribs are made from duralumin tubing or channel in quite simple sections.

The undercarriage embodies the oleo principle of shock absorbing mechanism, and wheel brakes of a very simple and effective type will be fitted.

AIR CURRENTS VISIBLE IN NEW WIND TUNNEL



A group of aviation leaders and scientists looking over the wind tunnel at California Tech.

THE accompanying photograph shows the huge Guggenheim experimental wind tunnel at the California Institute of Technology. The size of this famous wind tunnel is its most important feature, since almost any part of an actual airplane can be put into it; whereas, in the past most wind tunnels have been only large enough to test models of real planes.

There are windows in both sides of this wind tunnel, one of which can be seen in the photograph, so that very careful observation can be made of all wind currents as they are affected by the different airplane parts that are tested.

This wind tunnel will be operated, of course, similar to other wind tunnels. At one end there is the powerful fan blower which can be regulated so that it will blow air into the tunnel, to equal the counteracting air resistance into which an airplane flies at any speed.

White smoke is blown in uniformly at the blower. As the white smokey wind hits the airplane part being tested, one can actually see the action of the air currents on it. For example, in testing a plain airplane wheel, it would show, back eddies of smoke, behind the wheel—indicating a drag as the air goes by it, or as would be the case of a plane in flight—as it goes through the air.

When testing this same wheel with a streamlined covering over it, the smoke would not curl and form a pocket at the trailing edge, but both streams of air from the top and from the bottom would approximately come together smoothly. The speed value of "pants" can thereby be gauged with reasonable accuracy.

The Years Go By

The airplane of today is no different from that of 10 years ago. The progress of aircraft design is largely horseradish,

says

JOHN B. RATHBUN

Pusher type. Tailless. Sweepback. Looks like a modern German creation, doesn't it. It is Vincent Astor's Burgess-Dunne Seaplane, 1914.

IT IS the very commonly accepted opinion of the layman that aviation and airplanes have seen remarkable development since the historic Lindbergh flight. This is largely baloney.

This popular opinion is furthered by the appearance of German commercial propaganda in the public press showing weird and peculiar constructions novel to the beginner. In this case it becomes a matter of imported baloney. The old-timers are not deceived in this matter, those of us who have followed the game closely since the year 1908, and we view the strutting and boasting of the present aeronautic generation rather with amusement.

Just get hold of some old books on the subject, illustrating details of the ships constructed in days long gone by. Here you will see every structural feature now employed on the present day ship and a whole lot of good stuff besides that has been lying latent and unused all of these years. The great trouble rests in the fact that the present generation of designers and inventors have not taken the trouble to study aviation history. Instead of designing and inventing new machines and new devices, they are simply re-inventing stuff that is actually from ten to twenty years old.

These fellows have learned nothing from experience, but have gone on and on, repeating the errors and failures of by-gone years so that it would take a great stretch of imagination and a considerable spirit of tolerance to say that aviation has advanced at all during the past fifteen years.

And then the guy in the corner speaks up and delivers himself of the following standard quotation: "Well, what about performance? We travel twice as fast as we did several years ago and look at the endurance records that have been hung up in the past year. If the airplane of today is no different than that of ten years ago, then why are present planes faster and capable of covering greater distances than the old time ships that you are defending."

This statement can be answered very simply. The trend in the old days was to produce a practicable ship that would compete in cost with other vehicles of the time and to popularize aviation if popularization were possible. They had mostly in mind an efficient low priced ship that could be marketed at popular prices, just as with the automobile. The tendency was toward improving the performance by improving the efficiency of the ship rather than to adopt the doubtful expedient of simply hanging a more powerful engine on her nose.

The present day light plane builder hangs roses on himself for building a ship capable of fair flight with a 25-h.p. engine, but way back in 1910 there were many small ships flying with 15-h.p. or less, and a great number of recorded flights with 10-h.p. and less.

We very clearly remember the little Nieuport monoplane that flew so beautifully with its 12-h.p. two-cylinder Anzani engine and a number of "flivvers" of a like nature that put up an excellent performance with a limited amount of power. It might be said that 50-h.p. marked the high point in engine capacity up to war time in the majority of cases, so that so much dependence was not placed on the engine to pull the ship through as at the present time.

MODERNISTS point with great pride to the air-cooled radial engine as being representative of modern progress. Horseradish.

Air-cooled radials have existed from the earliest days of aviation and in highly practical form. Even in Langley's day, the radial engine was selected, and then followed the old Anzani engines and such radials as the Clement-Bayard, Bristols, et al. Bleriot's memorial cross-channel flight was by the aid of an Anzani Radial, and almost numberless flights were made by two-cylinder opposed types which are really nothing more than two-cylinder radials.

The rotary cylinder Gnome and Le-Rhone were really specialized radials that contributed much to the success of early aviation. Any principle in the way of engines that had not been tried up to 1914 is difficult to mention. We had four-cycle, two-cycle, radials, vee's, straights, char-a-bancs, inverted types, slide-sleeves, rotary valves, X's, and all the rest of them.

The modern sportsman's flying yacht isn't greatly improved over this ship. This flying boat was built for Rodman Wanamaker by Glenn Curtiss way back in 1914 at a cost of $200,000.

No, this isn't the latest Army fighter. Regarded by some as the most beautiful plane ever built, this 28-Nieuport was used by the American forces during the World War.

XUM

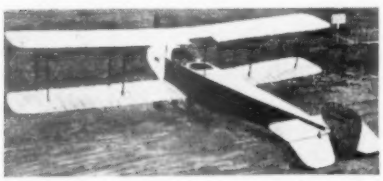
but Aviation Stands Still

Aviation is repeating earlier follies. The low wing monoplane, all-metal ship, and streamlined rotary engine were features of aircraft as far back as 1910. Little progress has been made since then.—*John B. Rathbun.*

Then we have the air-cooled vertical fore-and-aft engines which were produced in number, only to be discarded for other types. Any real advance that has taken place in the performance of engines must be attributed to manufacturing methods, improved lubricating oils and better grades of gasoline rather than radical improvements in design. Truly, a few minor details have seen refining touches, but there is nothing that can be considered as revolutionary in either principal or construction.

For a long time, designing freak aviation engines was one of the leading indoor sports and it will be a long time before all of these ideas have been used up. So far as reliability is concerned, we witness the London to Dardenelles flight during the war and the first trans-Atlantic flights essayed by the NC-4 and the Brown-Alcock trip, all of which took place eight years before the Lindbergh exploit.

And while all of the modernistic swank is being exhibited, we note with secret amusement that we still have all of the old objectionable features with us, such as noise, high landing speeds and very frequent crashes. This is undoubtedly due to the fact that the present day designer has unduly increased the power and speed without correspondingly improving the control of the ship or reducing the landing speed within safe limits.



The Avro of 1911 vintage. Many present-day training ships are built along these lines.

Surely, it does not require much engineering genius to substitute a 200-h.p. engine for a 100-h.p. engine to obtain higher speed. But when this increased power is accompanied by improved control and stability, then we can sit back on our haunches and crow about "improved design."

Automobile road speeds of 20 miles per hour in 1920 have gradually crept up until the present average speed on the concrete highways more nearly approaches 45 to 50 miles per hour. Evidently, this has been an inducement for the airplane constructor to correspondingly increase the speed of the planes, but unfortunately he did not follow the automobile practice of increasing safety and strength at the same rate.

The automobile of today has been made more sturdy to withstand the increased speeds, the steering mechanism has received consideration, and the riding qualities have been improved to meet the greatly augmented vibration, but this is hardly the case with the airplane. In the case of the automobile it has not only been a matter of installing a more powerful engine and letting the rest of the car remain in its former state, but improvements have been carried clear through. Witness the four-wheel brakes for greater safety at high speeds, the self-centering steering gears, the application of hydraulic shock absorbers, the use of balloon tires and numberless other details that make high speeds safe.

The present rulers of aeronautic destiny are wasting their efforts in re-developing and re-inventing ships and devices that proved a most decided flop in years gone by. We gaze sadly at the current pictures of "flying wings," now heralded as an innovation and heave a sigh. Old stuff—very old stuff indeed.

And then we see photos of the recent "tailless" marvels, bearing, as usual, the "Made in Germany" sign. Looking out on this familiar landscape carries us mentally back to Dunne, the old Valkyries, Igo Etrich and other old timers of this type.

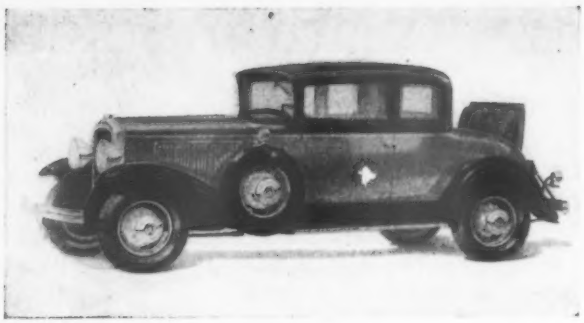
This Vought Corsair is unquestionably a beautiful modern fighting plane. But the old Nieuport on the opposite page doesn't need to be ashamed of itself by contrast.

The tailless "Pterodactyl," which was recently exhibited at the Royal Air Force Pageant, England. Contrast this newcomer with the old-timer on the opposite page.

They are digging up sweepback again after it has remained in oblivion for many years, and the wedge shaped entering edge is again coming into vogue. I wonder if they will ever learn anything from experience? Even Austria and Germany discarded sweepback during the war, and Austria and Germany were the original homes of sweepback and negative wing tips.

Within the last year a well known builder of planes came out with elliptic wings which were hailed as an innovation. If the reader will go back to the 1909 edition of Lanchester's "Aerodynamics" he will find the whole theory of elliptic wings very completely covered. It is hardly possible to conceive of any wing plan, form or aspect that has not been experimented with in past years, ranging from circular wings to the various birdlike outlines that were so popular in Continental Europe so many years ago.

EXPONENTS of the modern school point proudly to the metal fuselage. This is pointed out as being a



The fine progress made in automobile design is indicated by the 1912 model, shown at the left, compared with a recent model of the same make.

vast advance over the fuselage of past years.

As a matter of fact, steel tube fuselage has been with us for many years. I used it in a ship that I built in 1912 and I copied from another fellow who had built his machine a good two years before. I rather suspect that he in turn copied the idea from somebody else, but could never get him to commit himself on this point.

About 1912-1913, the all-metal fuselage was being boosted as the salvation of aviation, just as today, but experience failed to show any very marked advantage over other types, and during the war the gas-pipe fuselage fell largely into disuse except on the Fokkers. War time Bristol ships and British Colonials presented a few tubular types as well as several French ships. The old Breguet had an all metal ship way back in 1910 with hydraulic shock absorbers, pants on the landing gear, variable incidence control and all the other gadgets that are fondly believed to be ultra-modern.

This Zeppelin Dornier biplane, built in 1917, was the first dural plane to have a metal outer cover. Note the complete absence of wing struts.

Ninety per cent of the present gas-pipe constructions are actually nothing but revamped wood fuselage in which tubular steel members are substituted for the wood members of a wood fuselage. There is nothing at all about them that indicates true metal practice. The ships still come down in flames, and as wood is still used to a great extent as a material for wing construction, except for the Ford Trimotor and one or two others that are examples of all-metal construction, we are still a long way from the all-metal ship.

Steel tubing entered aeronautics at a comparatively early date and cannot be hailed as a novelty. It started out as a material for the outriggers of pusher type ships, then as interplane struts and finally entered the fuselage, all prior to 1910. It may come as a shock to the newcomers that an American pinch hitter in the Gordon Bennett cup races entered the contest with metal wings, oval tubing for the ribs, metal tube spars and all complete in 1912.

Breguet, a French pioneer, was a man of vision, and between the years 1910 and 1912, incorporated many of the novelties of that day into a single ship bearing his name. This was a metal ship, christened the "teapot," because of its tinny appearance, and was provided with oleo-pneumatic shock absorbers, adjustable wing camber and incidence, real streamline "pants" on the chassis, a universal cruciform tail assembly, a Renault air-cooled engine and a host of other trick stuff that has since been charged up to modern invention.

This old ship did her stuff, and so did the other Breguet ships during the war. Then there was the English "Silver Dart," with its reinforced sheet metal hull, the B. F. Sturtevant rolled section fuselage, and many other metal constructions that started out to be true metal ships instead of mere actual substitutes for wood members.

Finally, steel tubing fell into disrepute as a simple substitute for wood construction and then the trend went toward molded monocoque veneer construction as witness the Deperdussin, the L. W. F., the Roland and other old-timers. At that period, however, there were no suitable waterproof glues for the veneers and as the art of veneering was at a low ebb, that interest fell off gradually. However, it seems to me that it would be a far better plan to resurrect monocoque construction rather than to keep on with the present tubing.

Long ago the desirability of streamlining was fully recognized, and probably the first step in this direction was by Santos Dumont, who streamlined the pilot sitting in an exposed position on the little Demoiselles.

With the coming of the enclosed nacelle and fuselage we find attempts at streamlining these members in the old Antoinette, the Handasyde, Borel-Morane and numerous American ships.

Finally, in 1912 came the true streamline molded fuselage as represented by the Gordon Bennett Deperdussins, so far advanced in design that it is difficult to distinguish them from the present day Lockheed "Vega." They did record work in the old days, 108 m.p.h. with a rated 50-h.p. rotary cylinder Gnome engine, which actually developed about 35-h.p., a showing that is not at all bad in the light of present practice.

AND now let us take a look at the present day ship in its entirety—in full possession of all the defects existence in 1920.

She is a tractor type in most cases, well adapted to army life, but not so good as a passenger ship where all on board would like to get a full view of the countryside. She started out as a pusher, became a tractor by military necessity, and just as a prediction, is likely to become a pusher again. Her wings look just like the old times with the conventional ribs, spars and fabric covering. Aside from being considerably thicker, there is no change here, except that the thicker wings have reduced the external bracing in the monoplane types.

Some seem to think that the low-wing monoplane is a very modern design. It *was* way back in 1907, when this picture of a Bleriot VII was taken.

Two wheeled landing gear is with us as of yore, with shock absorbers and in many cases with streamlined wheels. But so were the Breguet wheels with their "Harme skirts" way back in 1912. Nothing to rave about—nothing new at all—even to the divided axle, which was also divided in many ships prior to the war.

Same old four-stroke engine—either air or water-cooled, and stuck out in front as per usual. With the exception of a higher compression and a greater horsepower necessary for overcoming other defects in the design we are not very much thrilled and can still find our way around in the dark.

(*Concluded on page* 63)

Largest Aerial Survey Ever Made

THERE has recently been completed an aerial survey larger than any ever undertaken in connection with one single engineering project. It required the taking of more than 14,000 separate exposures.

The survey was made in order to secure information for government engineers engaged with the technical problems of President Hoover's flood control plan for the Mississippi River. The aerial expedition covered approximately 9,000 square miles in the middle-lower Mississippi basin, covering large portions of Kentucky, Tennessee, Arkansas and the State of Mississippi.

As each photograph had to be fitted into large line maps and topographic maps, there could be no serious error in overlapping. In other words, each photo had to be taken at the same stated altitude. These stringent requirements made the task one of the most difficult ever given to commercial flyers.

From four to six planes, flying continuously for eight hours, worked constantly for five months recording topographical history of the river.

The aerial photographs were made on a scale of one inch equalling approximately 1,500 feet. To cover the 9,000 square miles surveyed, more than 14,000 separate exposures were necessary. From these, more than 56,000 photographs used in making both line maps and topographic maps were made. The pictures taken covered five square miles for each exposure, but considerable allowance had to be made in this for necessary overlapping when the photos are fitted together in large topographic maps.

Dusting Crops by Airplane

THIS excellent action photo shows the dangerously low altitude at which a crop-dusting plane must fly. Precarious hedge-hopping is necessary in order to cover completely the trees and bushes with poisonous dusts to kill harmful insects.

The dust is carried in a tank underneath the fuselage and the wind rushes through the tank, scattering the powder over the trees.

Major Doolittle Decorated by Foreign Government

An ex-army flyer of international fame, Lieut. (now Major) James H. Doolittle, was recently awarded a decoration, which in name stands as the most appropriate ever given by an appreciative government to a flyer for exploits of valor and skill.

In 1926, Doolittle, representing a prominent American manufacturer of military airplanes, was demonstrating this company's products to the governments of the Southern continent. His actions read like a page torn from the wildest of fiction. When one European demonstrator took the air in competition with him, Doolittle took off also and rode his competitor down to the ground.

Later on, the tibia of both legs broken by an accidental fall, Doolittle took off, his crutches beside him in the cockpit, and flew over the Andes from Santiago, Chile, to LaPaz, Bolivia.

Appreciative of his incomparable flying skill, Bolivia turned over to him the decoration of "Officer of the National Order of Condor of the Andes."

As he is a Reserve officer at the present time, having resigned last year from the Regular Service, Doolittle is authorized to accept this foreign decoration without first obtaining the consent of Congress.

17-YEAR OLD BOY WINS RACE WITH HOME BUILT PLANE

Youth borrows money to enter race; then walks off with 2nd prize

Right, Walter Franklin in his prize-winning Church Midwing. Above, the successful racer equipped with pontoons.

WALTER R. FRANKLIN was only 17 years old when he learned to fly. After he had accumulated about ten hours' flying, he found that he lacked the necessary funds to complete his training.

Young Franklin decided that the best thing he could do under the circumstances was to build his own airplane, and build up his time in it.

He purchased a construction kit from the Church Airplane & Mfg. Co. for $200.00 and built his own plane from the instructions and blueprints furnished. When he had completed his little ship, a well-known transport pilot at his local airport at Kankakee, Illinois, offered to test hop it for him.

The transport pilot was so favorably impressed with Franklin's little ship that he persuaded Franklin to enter the plane in the 1930 National Air Races, which were to take place in only three weeks.

Franklin decided to do this, and a few days before the races were to start, he flew to Chicago. To his great disappointment, he found it necessary to put up a $100.00 entrance fee. Although he knew this $100.00 would be returned after the races, it did him little good, since he didn't have the $100.00.

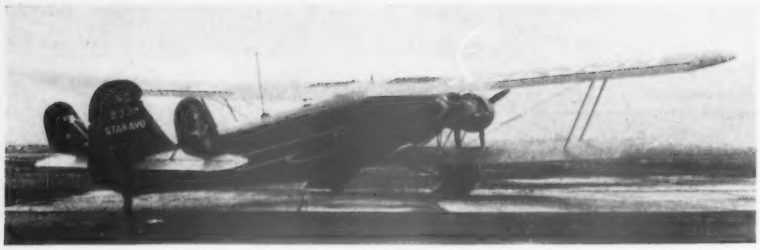
He was determined to enter his home-built plane in the races, however, so he called on Mr. Church, the man from whom he had purchased his construction parts. Mr. Church loaned him the $100.00.

The day of the lightplane event at the races arrived and young Franklin discovered that he had five competitors, each one having a factory-built light plane. Although Franklin's spirits were undaunted, it appeared to those that looked over each of the planes scheduled to fly in the lightplane event that the odds were greatly against Franklin's plane winning the race.

The propeller on Franklin's plane was made of soft wood, rather than hard wood, a factor which greatly decreases propeller efficiency. Not only was his propeller of the wrong kind, but the one he had was in poor condition. Both ends of the blade had been chipped off and were patched up with cloth.

Franklin's plane took off and entered the race. It was event No. 3, the Men's 110 cu. in. free for all—5 laps, 5 miles course. To the surprise of the astonished onlookers, Franklin's plane won second place with an average speed of 72.29 miles per hour. The second prize was $225.00.

Mr. Church was so greatly impressed with young Franklin that when he came to pay back the $100.00 entry fee, Mr. Church offered him a position in his airplane factory.



Boeing Trimotor Delivered to Standard Oil

A TRI-MOTORED Boeing biplane has recently been delivered to the Standard Oil Company of California for the use of company executives.

The new plane is powered with three 525-h.p. Pratt & Whitney 9-cylinder, air-cooled "Hornet" engines, and is capable of a high speed of 145 miles per hour and a cruising speed of 120 miles per hour. It carries 650 gallons of gasoline, giving it a cruising radius of 7 hours.

The ship has a wingspread of 80 feet, and a fuselage length of 55 feet. From the ground to the top of the pilots' cockpit is 16 feet, and the landing gear has a spread of more than 18 feet. The net weight of the plane is 5⅛ tons, and when loaded, 9 tons.

Although normally an 18-passenger plane, arrangements have been made to carry only eight. The cabin is equipped with overstuffed chairs, lounges convertible into 2 private sleeping quarters, portable tables, a buffet with necessary utensils and gas stove, and restroom and baggage-carrying facilities.

The cockpit is fitted with complete dual controls, with the latest flying and navigating instruments mounted on dual instrument boards. There are facilities for two-way radio-telephone communication with ground stations, and also a passenger-pilot telephone and a radio set for receiving broadcast programs. Another feature is an all-purpose camera for taking pictures through an opening in the floor of the cabin.

Army Cadets Receive Instruction on New Flight Tutor

THERE is now at the Army Primary Flying School at Brooks Field, San Antonio, Texas, an improved type Flight Tutor. Improvements in this machine include:

1. Lighter car to reduce the force of momentum.
2. A more equalized effect of the three-control surfaces.
3. A larger electric motor to give a stronger air stream.
4. A larger and more comfortable cockpit.
5. A system of electric brush contacts that will not overheat, and
6. An improved telephone system.

The purpose of the Flight Tutor is to determine to a large extent the aptitude of a candidate for flying training. In addition, it should educate the applicant in (1) familiarity with the unusual positions which an airplane is capable of assuming; (2) feeling the use and effect of controls, and (3) becoming accustomed to noise similar to that of a plane in flight.

The principle of the Flight Tutor is to provide a mechanical device which will operate as nearly as possible like an airplane. The car is actuated by a three-bladed propeller, driven by a 20 horsepower motor which is placed in the nose of the car. The car is hinged at the nose and tail in a frame which is again hinged in the third dimension to a larger frame. The car, then, is

An Army student is learning the feel of the controls by operating the latest model Flight Tutor.

actuated directly by the action of the air stream from the propeller on the control surfaces. These surfaces are similar to those of an airplane, consisting of ailerons, elevators and rudder. The control surfaces are operated exactly in the same manner as those of the general type of land planes. It can be placed in every position that a plane in flight can assume.

The fact that it is a mechanical device resting on the ground handicaps its operation as compared to an airplane in flight in several ways: First, it receives no sustentation from the air stream; second, its change in balance does not provide the same centrifugal force upon the pilot; third, gyroscopic action effects operation throughout flight, which is not true in an airplane while in flight. It is impossible to simulate maintenance of equilibrium of forces necessary in airplane control.

Air Brakes Used on Large Transport

ONE of the features of the huge D-2000, the German airplane built to carry forty-five passengers, is the smoothness of its airbrakes.

These compressed air devices, which are of the Knorr pattern used on the Reichsbank's cars and locomotives, enable the pilot, simply by throwing a switch, to reduce the space required for landing the big plane by at least one-half. The pressure applied to the wheels is so well regulated that there is said to be no danger of an upset, nor of the plane doing any rough riding when it lands. An automatic control sets the brakes tighter as the speed of the wheels is reduced and finally stops them altogether.

Pilots can apply different degrees of pressure to the brakes on the different sets of wheels, thus causing the planes to swing from a direct line when landing and run in semi-circles, something also calculated to lessen the space needed for runways.

On some planes the compressors are operated by power from the motors, while in others they are driven by an auxiliary propeller.

Motor Oil Tested at High Altitude

THE New Socony Motor Oil recently passed a severe and dramatic test in the upper air.

Carrying a regulation quart bottle of the oil, Captain Boris Sergievsky, holder of the world's altitude record for amphibians, shot his record-holding ship up more than four and three-quarter miles, 25,200 feet on a sealed barograph, where the thermometer registered 6 degrees below zero.

At that extreme, low temperature, where ordinary oils would usually "freeze" or become sluggish, the new oil flowed freely. The plane was lubricated with the new oil and functioned perfectly.

The reason for the oil's fluidity, which proves it to be as efficient in extreme cold as in extreme heat, is the fact that it is completely dewaxed. Under low temperature, wax congeals. If an oil contains wax, therefore, it will get "stiff" or sluggish in cold weather. The new oil has been completely dewaxed by a special mechanical process.

Blown to Pieces at 6000 Feet

—*but I wouldn't do it again!*

by A. KINNEY GRIFFITH

An actual movie stunt by the author

FLYING always has been my hobby. I was a combat pilot during the war. Since then my big handicap was of being a penniless orphan, lacking the health to do hard work.

I became a barnstormer, a flying circus stunt man — a wanderer, but always drifting back to the old home town.

In the eight years that followed the war, I had gained the reputation of being the prize mis-fit in town. Nobody believed in me.

With the hope of making some quick money, I bought a second-hand Hisso Standard biplane with nearly all of my cash. It was a good substantial plane, equipped to carry two passengers, mail and baggage. I got a landing field, rent free, on the edge of town, and a temporary franchise to establish an air route to Portland.

The business venture was doomed to an early failure, however, as the easy-going localites would not patronize my airline — it looked too dangerous to them.

They had no confidence in me. In fact, I was soon considered a public nuisance; it seemed that the roar of my plane disturbed the slumbers of the folk. The chickens did not lay their usual amount of eggs, and the cows were going dry. I was to blame.

When I appealed to the local bankers for a loan with which to buy better equipment, I was turned down flat. Finally, in desperation, I went to George Ronson, president of the National Bank, and again met with the same refusal.

"No, Al, I won't lend you the money. Your security is insufficient, and you have no responsible endorsers. Not only that, but your idea is entirely too modern for this part of the country."

He was right. There was no use arguing. I started toward the door.

"What will you do now, Al?" my friends asked that evening.

"I don't know," I replied. "There's a great future for an air-passenger line here, if I only had the money to get it started right. I don't care much for the local trade; it's the commercial men from the outside I'm after. They realize the importance of saving time while traveling.

"I'll — I'll put it across somehow," I stammered, "you watch and see."

I did think it over. The result was that bright and early one morning I hopped off in the old Hisso Standard for — *Hollywood.*

THREE months passed. My letters were filled with the optimism of youth. Repeatedly, I wrote about making a fortune in the movies, but I said nothing about the lean time I was having.

I did not mention my one meal a day; nor that I hadn't flown my plane since arriving in the film capital, as I had not the funds with which to buy gas.

I picked up odd jobs as a stunt man. I loitered around on the corner of Cahuenga and the Boulevard, listening to the gossip of the movie colony.

One day I overheard that a certain film producer had offered Micky Malone, a well-known stunt man, $5,000.00 to explode his airplane at 6,000 feet during the shooting of a big war-flying picture.

Malone had turned the offer down flat. He did not need the money that badly. Several other famous stunt men had also refused the offer; the chances were they would never live to spend the money.

Five thousand dollars! I visualized what I could do with that sum, but I failed to visualize the hazards in getting it. Instead, I took the shortest route to the producer's office. After the usual red tape was unraveled, I was granted an interview with the director of the big flying picture.

Ten minutes later I had the job. My short term contract stipulated everything including who was to be notified in case of death.

Later that day I pawned my watch for enough money to buy gas and oil sufficient to fly my ship to the location at Valley Airport and to take it up to the required altitude for the scene which was to be shot the following day.

Arriving at the location field, technicians immediately set about placing a time bomb in the old plane's fuselage. Another bomb was placed in the gas tanks. The dangerous stuff was then wired to a battery which touched off a ten-second clock when a switch-button was pressed. Other prop men painted black Maltese crosses on the wings and

A scene from the silent version of Hell's Angels. The author is flying the ship in the center.

fuselage. The old Hisso-Standard now resembled a war-time Fokker.

I did not sleep well that night.

THE day of days arrived. After smoking an endless number of cigarettes and endeavoring to control my nerves, I got the signal to get ready. Immediately I started the Hisso motor.

High in the upper blue, a battle between four Spads and four Fokkers was in full progress. Ships carrying directors and cameramen were circling the combat. A Fokker fluttered down, apparently out of control. A Spad followed, a long stream of black smoke trailing from its cockpit as it fell.

I shuddered at the sight, even though it was but mock combat, and climbed into the pilot pit. The motor temperature was up. Grimly I braced myself at the controls and gave 'er the gun. The Hisso Standard rolled forward, took off, and climbed toward the dog-fight. Up it went in a graceful climb — up on its last flight.

"Oh, well," I though to myself," Pauline will get the five thousand bucks if I fail."

I wondered if the property parachute would do its stuff.

At six thousand feet I sent my O.K. signal to the directors' plane. Everything was ready. More cameras started to grind. They signaled for me to let go.

Immediately I pressed the switch button. I would have ten seconds to leave the ship—I hurried. I started to "bail out," *but I never got over.*

Without the slightest warning, the entire plane blew to pieces. The explosion was premature. Either the time clock was faulty, or the technician had miscalculated. At any rate, there was just two seconds between that fatal press of the button and the explosion. Sprays of fiery gasoline were thrown in all directions. I was in the midst of the blast. I was blown out of the plane cleaner than the motor was; a farmer dug it out of his orange grove that evening.

Knocked unconscious, I fell like a plummet. A shattered piece of fuselage hit me as I passed it on the drop. The blow woke me up.

My returning senses told me that the wreckage and I were doing a race toward the earth. Then my leather jacket caught afire, the heat searing my shoulders and neck. Down to three thousand feet. I grabbed and pulled the rip-cord ring. A split-second which seemed like a year followed, then the pilot 'chute popped open and the long string of the main skyhook followed.

It opened with a jerk. Blazing fragments of the plane were falling all around. Then the big silk spread caught fire. It began burning in a dozen places.

I felt my descent increasing. I slapped at my burning shoulders and eyed the spreading holes in the 'chute. The fumes of my burning clothes gagged me and sapped my remaining strength. My breath was coming in gasps and I felt consciousness waning.

(*Concluded on page* 64)

MODELS THAT NEVER FLY
by ENSIGN CHESTER C. WARD

DRAB, wooden things that could never fly—how useless they seem to the casual observer, yet they are important enough to our Navy, for hundreds are built yearly at a cost varying between $300 and $500 each. And their particular use is more vital than

Above, a Naval draftsman working on scale drawing from which model will be built.

Right, the Control Room, showing operator at desk in foreground reading scales.

Below, the model of the notable NC-4, the first trans-Atlantic airplane.

that of any gossamer-winged model that ever flew, for each of them may have helped to save thousands of dollars, months of time, and hundreds of pilots.

These models are made at the Navy Yard in Washington, D. C., and are used in the large wind tunnel there to predict the performance and airworthiness of all new types of aircraft proposed for the Navy.

In the early days, before the development of such wind tunnels and precision models, new types were merely precarious "guesses" until they had been constructed—at great cost—and test flown, at no small risk of the pilot's only neck! Seeking to avoid these costly and unscientific experiments, aeronautical engineers discovered that if a wind tunnel were used, small wooden models, sufficiently accurate in proportion, would be much better for most purposes than an actual test flight.

But the construction of models exact enough to insure accurate performance predictions proved a delicate and interesting work, in which Naval designers were pioneers. Before work on the models is begun, it is necessary to have special drawings made to scale; these are transferred to zinc plates by a photographic process, and the plates cut out so that they form an exact pattern for the corresponding wooden parts.

Four skilled model-making carpenters are employed in the actual construction work, and they have a shop of their own in the wind-tunnel building, especially designed and equipped with the most modern tools. Despite all this, the work is so exacting that it takes from three to five weeks to complete each model.

To prevent warping and other distortions which would ordinarily result from exposure to atmosphere, laminated Honduras mahogany is used, and the completed model is varnished with weather-resisting varnish. A set of delicate micrometers are then run over the model to test for true proportions. These micrometers register in one-thousandths of an inch, and any variation of the model from the plans which exceeds two one-thousandths of an inch is corrected before tests are begun.

The tunnel itself—one of the first and most famous in the country—is oval in shape and of wooden construction. The wind is furnished at any desired speed up to one hundred and eighty miles per hour by a huge fan

(*Concluded on page* 51)

War Hero Killed in Aiding Lost Battalion

THE popular belief that the late Lieut. Frank Luke, generally referred to as the "Arizona Balloon Buster," was the only war-time flyer to be awarded the Congressional Medal of Honor posthumously has been found to be erroneous.

As a result of this latest check on the names of those American heroes whose deeds of valor in combat against an enemy won for them the highest recognition it is possible for this country to bestow upon them—the Congressional Medal of Honor—it was found that another American airman was awarded this decoration posthumously —1st Lieut. Harold Ernest Goettler, pilot, 50th Squadron, Air Service. The medal was given to the mother of the deceased officer in 1922, the citation accompanying the award reading as follows:

"Lieut. Goettler, with his observer, 2nd Lieut. Erwin R. Bleckley, 130th Field Artillery, left the airdrome late in the afternoon on their second trip to drop supplies to a battalion of the 77th Division, which had been cut off by the enemy in the Argonne Forest. Having been subjected on the first trip to a violent fire from the enemy, they attempted on the second trip to come still lower in order to get the packages even more precisely on the designated spot. In the course of this misison the plane was brought down by enemy rifle and machine-gun fire from the ground, resulting in the instant death of Lieut. Goettler. In attempting and performing this mission Lieut. Goettler showed the highest possible contempt of personal danger, devotion to duty, courage and valor."

The flight mentioned in the citation took place near Binarville, France, October 6, 1918.

Lieut. Bleckley was also killed in the crash of the airplane, and the Medal of Honor was also posthumously awarded in his case, being presented to his father, Mr. E. E. Bleckley.

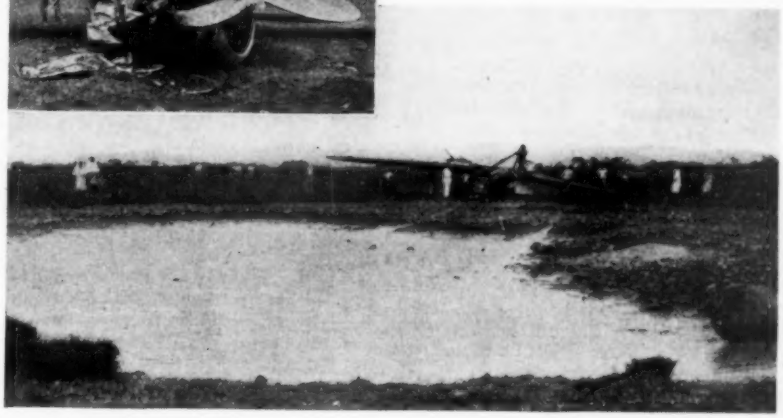
As the reader may have surmised, the battalion of the 77th Division referred to in the citation was the famous "Lost Battalion," commanded by the late Lieut.-Colonel Whittlesey. Incidentally, the "Lost Battalion" was found by Lieut. Robert M. Anderson, Air Service, a member of the 50th Aero Squadron.

Pigeons Defeat Planes in Race

FIVE carrier pigeons beat an airplane traveling 105 miles an hour in a race from Oslo to Jesshim. A sixth pigeon came in at exactly the same moment the plane did.

The pigeons were chosen from the fastest in Norway and were pitted against one of the small planes used by the Air Force. The plane took off at the moment the pigeons were released.

THE RECORD FLIGHT FROM NEW YORK TO PANAMA
Distance Flyer Cracks Up at End of 2700 Mile Flight



Two views of the finish of the "Blue Flash." These pictures were sent to us by one of our Panama readers who arrived on the scene shortly after the crash.

FRANCE FIELD, Panama, was the scene of another record flight when Captain Roy W. Ammel touched the wheels of his low-winged Lockheed monoplane "Blue Flash" on the landing field, completing the first non-stop flight on record between New York and Panama. The flight was made in a little over 24 hours.

Of the 2700 miles of flight between Barren Island, New York, where Captain Ammel took off, and France Field, 1400 miles is over water, and the pilot tells an interesting story of his trip.

"I had an ungodly time getting off from Barren Island, but not as hard a time as the newspapers described. After getting into the air, I found my course and passed over Washington, Richmond, Atlanta, Jacksonville, and left the States at Miami. I know that I passed over Cuba at Matanzas, and I say I know because Matanzas was the first town that appeared clearly after I left the coast of the United States. I experienced bad weather, including rain most of the way and head winds all of the way, from the time I left New York until I arrived at France Field. My course should have brought me over the Isle of Pines, but the clouds were so thick that I failed to see the Isles.

"Sleepy?" The Captain laughed. "I fell asleep twice. One time there was no harm done. The second time I awoke just in time to clear a row of palm trees somewhere along the Nicaraguan coast. France Field sure looked good."

But fate rode the wings of the "Blue Flash." The day of the return flight it was found that the oil tank was leaking. Repairs were necessary. From the time of the arrival, the plane had been in charge of a commercial organization. When it was found necessary to disassemble the plane in order to reach the defective oil tank, the mechanics of the 25th Bombardment Squadron pitched in and corrected the difficulty.

After sixteen hours' work, in which the plane had been completely disassembled and reassembled, Captain Ammel took off for Anton, where he was to take on his supply of gasoline and oil for the return trip to the States.

The motor reved to satisfaction. The blocks were pulled and the "Blue Flash" was off, carrying Captain Ammel, 710 gallons of gasoline, forty gallons of oil and the luck that brought him down here—but—on the take-off the plane appeared to lack rudder surface inasmuch as it swayed from side to side. About the time the ship gained flying speed and was under control, a mud hole loomed ahead which washed out the right wheel of the landing gear. A cloud of dust—and the "Blue Flash" was a mass of wreckage.

Master Sergeant Tate was the first to reach the plane. Despite the fact that he was facing the explosion of the fuel tanks, he tore away the side of the plane and rescued the pilot.

"I guess I am lucky," Captain Ammel said, "because I meant to cut the switch, but before I could do it, everything was all over."

At Gorgas Hospital, Captain Ammel was found to be suffering from nothing more serious than contusions and shock. He is planning the reconstruction of the "Blue Flash" and a flight to Europe.

"Plenty of stomach, that bird has," Mechanic Hunter was heard to remark, and Hunter was the one who held him

(*Concluded on page* 57)

A view of the tractor dragging the gliders back to the starting point.

Tractor Put to Work by Glider Club

GLIDING is making rapid strides as a coming sport in California. The sandy stretches of unobstructed beach make ideal fields for the enthusiasts of the San Francisco Glider Club.

The members are fortunate in having found a ready means to handle their two gliders, which weigh 220 pounds. They now use a tractor to pull their gliders back to the starting point.

It used to be that they could make only one flight in about 15 minutes. It would take them two or three minutes to go down the hill and then it would take ten or twelve minutes to pull the gliders back.

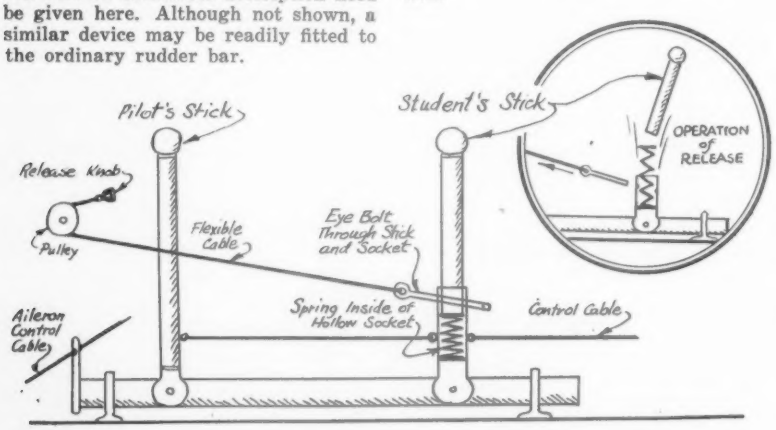
Now this time is trimmed down, and as a result many more flights are made every day when weather conditions are favorable.

Reader Designs Ingenious Safety Stick

WE are indebted to Walter Balchunas, of Chicago, for this sketch of an ingenious control stick he has designed and tested.

The purpose of this safety stick is to allow the instructor to disengage the student's control in case of the latter becoming confused or freezing to the stick. Many unfortunate accidents have been caused by a novice's tendency to freeze the controls and it is Mr. Balchunas' belief that this device will eliminate this hazard.

The construction and operation of the safety stick is so simple and obvious that no additional description need be given here. Although not shown, a similar device may be readily fitted to the ordinary rudder bar.



TRAPPED IN A SPINNING SHIP

A true experience of John C. Charleson*

ON the 14th of July at Roosevelt Field, a young sportsman from Rye asked me if I would test his little two-seater biplane in a spin. He had been a flying pupil of mine who had made a few solo hops, but not in this particular ship.

It was then about noon. I decided to take it up at this time, as there were few ships in the air. I strapped on my parachute, which was necessary, due to the Department of Commerce Inspector's habit of grounding pilots stunting without one.

The day was very clear; I revved up the motor, taxied down the field to get into wind, gave her the gun and was off in a hundred yards. Reaching the ceiling of visibility, which was about six thousand feet, I decided to give the boys on the ground a thrill, with a few acrobatics. Tightening my safety belt, I turned into wind and slow rolled across the field. Diving to put on speed, I pulled her up into a tight loop. Afterwards I decided to do a few flick rolls. Then I remembered I was getting paid for testing the ship in a spin and was not on my old job stunting with the flying circus.

Pulling up the nose, I kicked on hard rudder. She started easily, turning nicely with the nose straight down. Neutralizing the controls, in less than half a turn we were once more in flying position. Repeating the performance with opposite rudder, so as to spin the other way, it came out just as quickly. Climbing back to six thousand again, we went in for another.

At four thousand I decided to come out and glide into the field. In attempting to neutralize the rudder, discovered the rudder bar had fallen back against the floor-board. It was jammed. Failing to get my shoe underneath, I then tried with my hand, but could not reach it owing to my safety belt, and then discovered that the bulkiness of my chute and my one hundred and eighty pounds crammed into the unusual smallness of the cockpit forced me to give up all hope in that direction.

I had lived a lifetime in those sixty seconds. In each attempt to loosen the belt, I had lost over five hundred feet. Glancing at the altimeter, it read three thousand. The ship was spinning at an alarming rate with me on the inside of the spin and a tremendous force operating against me getting out.

I tried to get a hold on the trailing edge of the top wing, but the toughness of the fabric resisted my efforts. Looking over the side I could see the pedestrians below me. In making another frantic grab for edge of the wing my fingers sank through the fabric and I found myself with a hold on one of the ribs. Mustering all my strength in one great effort, I pulled my body to a standing position, got the seat pack clear of the pilot's headrest, cut the switch, and yanked the rip-cord of my chute.

I could not jump. My only hope lay in the opening parachute tearing me loose from the spinning ship.

The chute went out in a string-like form, dragging me with it, but not far enough to miss the elevator, which struck me a terrific blow on the head.

My body, continuing to turn slowly, half closed the chute, and due to the blood from the wound in my head filling my eyes I could not tell if the lines had become unsnarled or not. (I lived a lifetime of horror in those few seconds.) In my semi-conscious state I heard what seemed to be a terrific crash. Thinking for a moment it was myself, and that it was all over, I became limp, which was one of the main factors in my miraculous escape. In this condition I settled on some soft ground not more than one hundred and fifty yards from the tangled mass of wreckage that had been my companion a few moments before.

I was rushed to the Mineola Hospital, where my head was sewed up and in a few days I was my old self again.

* One of the youngest members of the Caterpillar Club. Transport pilot No. 13101 with Instructor's rating.

The "Firefly" Biplane

THE "Firefly" biplane, a single seater British fighter, which is powered with the 550 h.p. Rolls-Royce liquid-cooled "F" motor, is one of the fastest fighting aeroplanes in the world. Its maximum speed at a height of 20,000 feet is stated to be more than 210 miles an hour, which places it far above any military aircraft built outside Great Britain.

In rate of climb the machine is equally extraordinary, reaching a height of four miles above the ground in a few minutes.

A Lesson *in* Aircraft Instruments

A complete description of the airplane instrument board

SITTING in the pilot's cockpit we note a number of instruments on the dash in front of us. Many are familiar to the driver of an automobile, while others are entirely foreign to his experience and therefore are mysterious. If we were in the pilot's compartment of a large multi-motored transport plane matters would be still more bewildering for the number of instruments and their variety is still further increased. Part of them are engine instruments, part of them for navigation and a third part indicate the flying attitude of the ship. Some are indispensable and are demanded by law, while others are more or less a matter of convenience and a check upon the judgment of the pilot.

Oil Gauge

Four instruments are generally devoted to each engine installed, and if there is more than one engine, then the number in this group increases correspondingly. First we have the conventional oil pressure gauge that indicates the pressure of the lubricating oil pumped to the engine bearings, found on every automobile as well as on the airplane. Second is the temperature dial that shows the jacket-water temperature of a water-cooled engine or the oil temperature of an air-cooler. This is also a familiar instrument to motorists, and there may or may not be a gasoline gauge for determining the amount of gasoline in the fuel tank just as with a motor car.

Tachometer

Another engine instrument characteristic of the airplane, but not found on automobiles, is the Tachometer or "R. P. M. Indicator" showing the engine speed in revolutions per minute. This is not necessary with an automobile, as the auto engine is literally geared to the road so that its speed is indicated by the speedometer. In the case of the airplane, however, the engine r. p. m. is not always directly proportional to the forward speed. When the engine is working on a thin and variable substance like air, the

TRY THIS TEST!

Look at the instruments at the top of this page. Do you know how each one operates? And what it means to the pilot? . . . Then check your knowledge with the clear explanations in the following article.

engine "revs" may easily be above or below normal for a given flight speed. The Tachometer, therefore, gives important information to the pilot. And in fact it is one index as to the condition of the engine either in flight or idling.

AND now we come to the navigation instruments which are decidedly different from those appearing on the dash of an automobile. The automobile perambulates in "one plane" or along a comparatively horizontal surface, but the airplane is free to travel in three planes, horizontally, vertically and in a plane perpendicular to the other two directions, making more instruments necessary.

The speedometer gives us all the information that we need with a car, the speed and the distance traveled, but with the airplane we must not only know the forward or "translated speed" but also the compass direction, the altitude, occasionally the ground speed and the angle of "draft." There is, of course, no objection to using a compass on a car, but this is not so important as on an airplane where the pilot cannot step out occasionally and make inquiries regarding roads and directions.

Altimeter

Altitude, as determined by the "Altimeter," is an essential measurement to the pilot. He is required to maintain certain altitudes by law under certain conditions, and still more important, he must keep high enough during a night flight to avoid dangerous obstacles, such as mountain ranges. Altimeters operate on the barometric principle, that is, they read in terms of the varying air pressure existing at different heights. Near sea-level, the air is dense and the air pressure is high. At greater altitudes, the air density and pressure become less and less as the height is increased. The altimeter is actually a very delicate pressure gauge although its dial is divided into feet instead of pounds per square inch.

Compass

Then comes the airplane compass, familiar in general to everyone but decidedly different in matter of detail from the common hunter's compass. The most common airplane compass is of the magnetic type with a series of small pivoted north-seeking, permanent magnets, but instead of using a needle to indicate the direction, the magnets swing the dial around past a fixed line on the face of the instrument. This permits of more convenient mounting on the dash.

Owing to the presence of the engine and other large masses of metal, compensating magnets are installed so that the instrument will read north and south in spite of the counter attraction of the ship's metal acting on the elements. A more elaborate compass, called the "Earth Inductor" type, is used for long flights but is so complicated and expensive that it is seldom seen on the smaller ships. This was the type used on Lindbergh's historic trans-Atlantic flight.

AN earth inductor compass acts on the principle of an electric dynamo in which a coil of revolving wire takes the place of the armature while the earth's magnetism provides the magnetic flux or field. This armature coil is driven by a small propeller or windmill in such a way that it generates current when the ship points in one direction, but generates no current when it is flying on its course—the needle now remaining at zero. It is still a magnetic type, of course, but the earth's magnetism is utilized in another way.

It should be noted that the readings of any magnetic type compass are

variable with the location and are therefore not to be depended upon alone, unless we are provided with a magnetic deviation chart showing the trend of the earth's magnetism at that particular location on the earth. A magnetic compass does not always indicate true north by any means, hence the only positive method is the astronomical method adopted by maritime navigators.

Air-Speed Meter

Leaving the subject of the compass, we next pass to the Air-Speed Meter that indicates the speed of the ship in respect to the air passing over the wings. This must be distinguished from the earth-speed at which the plane passes over the ground for air-speed and ground-speed have no direct relation to each other when a wind is blowing. For example, with the air-speed meter showing an air-speed of 100 miles per hour, the speed of the ship over the ground in a thirty-mile wind may be 130 m. p. h. or 70 m. p. h., respectively, depending on whether the ship is flying with or against the wind. The important feature of the air-speed meter is its data regarding wing lift, stalling and the speed in still air. This is not comparable with the readings of an automobile speedometer for the speedometer is geared directly to the rear wheels so that it records the earth speed directly.

Like the altimeter, the air-speed meter is a form of pressure gauge. It is arranged to measure the pressure due to the impact of the air stream on an exposed nozzle. The pressure is then conducted from the nozzle to the diaphragm of the instrument where it moves the painter around the dial in proportion to the speed of the air. There are other types, but the instrument just mentioned is by far the most common.

Drift Indicator

ON the more elaborately equipped planes we find the Drift Indicator and the ground-speed meter by which the sidewise "drift" of the plane in a wind and the ground-speed can be measured directly. With the wind across the line of flight, the wind blows the ship sidewise at the same time that it moves forward so that the total direction of flight is along a line between the flight and wind directions, the plane actually moving at an angle with the centerline of the fuselage. This sidewise motion or drift will take the ship completely off the desired course unless the ship is headed into the wind by an amount equal to the drift angle indicated by the drift meter.

The drift meter therefore measures the angle made by the ship in respect to the ground, and is simply an optical instrument by which the motion of the ground is aligned by a cross-hair and then measured by comparison with a graduated arc. The reference hair is adjusted until the ground appears to travel along the length of the hair.

(*Concluded on page* 64)

New Automatic Trainer on Market

THE Custer Aviator is a fuselage shaped body mounted on a vertical piston. It has controls identical to those of a real airplane. The action is similar. It may be used either for training airplane pilots or as an amusement device.

As a device for training pilots it is of especial use in teaching the student to co-ordinate hand and foot movements. Position of stick and rudder bar for take-offs are learned as well as the maneuvering of the ship for a three point landing. The passenger being supported by the fuselage gets all the "feel" of real flight.

Take-offs and actual landings are made on the top of a specially designed platform. These are effected by means of a hand controlled throttle, a stick and rudder bar.

After years of experimentation with various actuating means compressed air was chosen as more nearly simulating actual flight than anything else.

The mechanism for accomplishing this result is quite simple consisting of two double acting cylinders and pistons for the banking and tilting of the fuselage and a third single acting cylinder and piston for raising and lowering the entire body. The bank and tilting of the body are controlled by a special universal valve on the lower end of the "stick."

The rising and falling of the fuselage is entirely automatic depending on the position in which it is held by the passenger. A correct flying angle will cause it to rise. If an attempt is made to climb at too steep an angle it will drop off into a tail spin—if it is nosed down it will descend—in fact every motion is analogous to that experienced in real flying.

All Metal Plane Has Covered Cockpits

THE 1930 International Circuit of Europe was won by Pilot Morzik, flying a new plane designed and built by the Bavarian Aircraft Works of Augsburg, Germany.

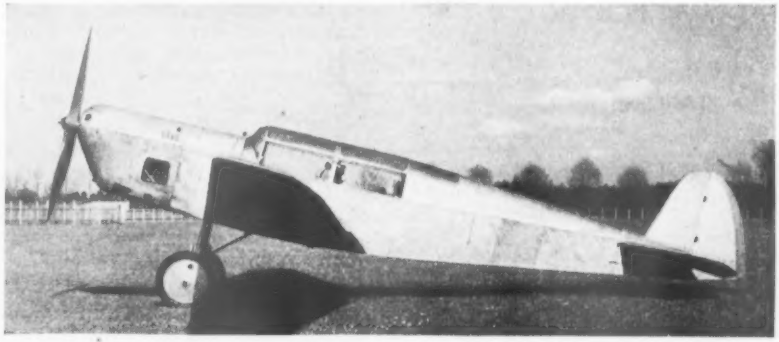
The winning plane, known as the BFW-M23-c, is a monoplane with cantilever wing design. The craft is featured by a fuselage of steel tubes, without cross-bracing, and wood-built wing-structure.

The design is such that it can be equipped either with a radial air-cooled engine or a straight-line motor. The cockpit has accommodations for two and is of the enclosed type.

Details concerning this plane when fitted with a Siemens 80 h.p. air-cooled radial motor follow:

Weight empty	708 pounds
Load	832 pounds
Weight loaded	1,540 pounds
Maximum speed	104.4 m. p. h.
Length	23 feet
Span	40 feet
Service ceiling	17,500 feet

Below, the B. F. W. monoplane powered with a straight-in-line motor. Neat, isn't it? Right, the passengers demonstrate how the cockpits are uncovered



America's First War Victory

TO LIEUT. ALLAN WINSLOW, of River Forest, Ill., goes the honor of the first official victory by a member of the United States Air Service. On Sunday morning, April 14, 1918, he and Lieut. Douglas Campbell, both members of the 94th Aero Squadron, were on "alerte," playing cards and waiting for a call. At 8:45 a.m., a telephone call came in stating that two enemy airplanes were about 2,000 meters over the city, about a mile from the airdrome.

Winslow and Campbell took off immediately in pursuit and, after a brief combat, Winslow brought down one of the airplanes out of control. It crashed alongside the airdrome in full view of thousands of spectators. A moment later, as Winslow climbed to the aid of Campbell, the latter brought down the other enemy airplane which crashed and burst into flames on the other side of the airdrome. Both combats took place about 1,000 feet above the ground.

The pilot of the plane shot down by Winslow was only slightly scratched, but the one shot down by Campbell was severely injured. Winslow was later shot down in Germany and made a prisoner. He lost his arm as a result of the crash.

Army Flyer Meets With Odd Accident

A Curtiss B2 bomber showing gunner's cockpit at rear of engine nacelle where accident occurred.

LIEUT. R. M. THORNTON, of the 11th Bombardment Squadron, Rockwell Field, had a very unfortunate accident during the recent maneuvers at Burbank, Calif.

He was riding in the nacelle of one of the "Condor" bombers enjoying the scenery and the intense aerial activity. The mission completed, truce was declared and the bombers settled to terra firma at the United Airport. After landing, Lieut. Thornton climbed up on the nacelle and jumped to the ground, unaware of the fact that the ring on his left hand had become fastened in the scarf ring of the nacelle.

The resultant jerk of the jump played havoc with the third finger of his left hand. First aid was administered, and after a brief stay in the hospital, Lieut. Thornton is now back on the job.

A Selection of Humorus Incidents—*by* PERCY B. PRIOR

QUEER mishaps have occurred during the history of aviation. Many of these have never been explained. Some were tragic, and others provided a comic relief from the monotony of training aviators.

A pilot once landed on a flying field in England to visit a friend. Taxying up to the hangars, he jumped out and left his engine running, intending to return almost immediately. This was a double infraction of the regulations. In the first place, he should not have left his engine running, and, in the second instance, he should not have left the throttle unclamped, which he did.

What happened, apparently was that a sudden puff of wind got under the starboard ailerons, forcing the control stick over to one side, thus sharply striking the throttle lever, which was fixed to the side of the fuselage. The next instant the plane, engine full on, was racing madly down the field. Being stable, it rose of its own accord, and was soon lost to view. Eventually it was found, more than a mile away, a complete crash.

The cause of a similar accident is much more mysterious. A line of seven or eight heavy bombers of the pusher type were being loaded on an airplane field in France, preparatory to a raid. At one side of the line another machine was being wheeled out to the hangar. For some reason or other it was left facing the end of the line of planes about one hundred yards further along the field.

A mechanic, so he said afterward, thought the switch was on, and promptly threw it out. But it appeared that the switch on this particular machine was upside down, and the mechanic instead of throwing it out, threw it in. The moment he did so the engine started up in some mysterious way and carried the plane straight for the line of bombers! With almost meticulous precision the runaway plane caught each of the rudders of the waiting machines, causing them to fall heavily backward upon their tail outriggers.

More humorous was the case of a pilot who was known as the "Mad Highlander," partly because he always flew in kilts, and partly because he was intrepid to the point of idiocy. One day, having flown for about ten hours all told, he took up an Avro to about 5,000 feet, where he put it in a spin and spun down from that height straight into the ground. The engine was buried nearly three feet deep, while the fuselage and wings were reduced almost to splinters — but from the midst of the wreckage the "Mad Highlander" emerged, complaining loudly that he had cut his knee.

Still funnier was the case of a certain squadron commander who never flew except twice a year to qualify for his flying pay. No one, so far as is known, ever encouraged him to go up, for when he did he invariably crashed.

On one occasion he discovered that he must fly immediately or forfeit a not inconsiderable part of his income. A service machine was wheeled out for him, the "nominal owner" looking ruefully on. The wind was blowing across some greenhouses to one side of the field, and there was not a man present who did not feel exactly what form the inevitable disaster would take—so much so, indeed, that the flight commander sent some mechanics to the edge of the field nearest the glass houses.

The gallant major walked breezily out of his office, clad like an Eskimo, though it was a warm summer day. "Nominal owner" shook his head sadly, threw a parting kiss to his cherished plane and walked hastily away in the direction of the officers' mess.

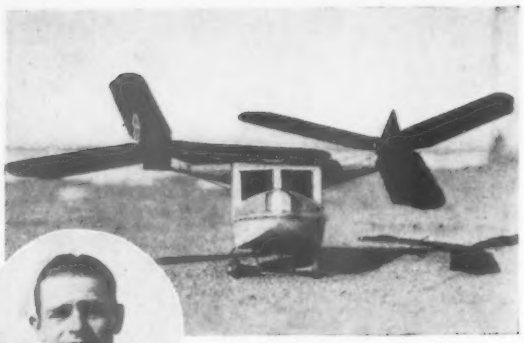
Before taking off the major instructed a mechanic to note his time in the air with a stop watch. The regulations made it necessary for him to fly twice a year, but did not specify how long each flight must be.

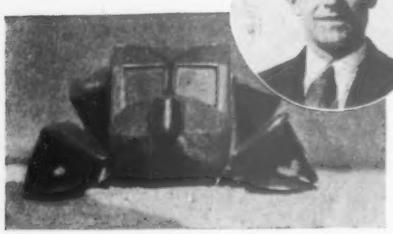
Finally the chocks were taken away from the wheels and the major rushed away in a cloud of dust to the center of the field, the plane swaying to port and starboard like an angry cat's tail. Up he went—straight into the greenhouse. The plane, as usual, was almost a complete write-off, but the major, cheerful as ever, was unhurt. Tearing back to the mechanic with the stop watch, he yelled: "Did you get the time?"

"Yes, sir," responded the mechanic, dryly. "Forty-five seconds."

"Good!" said the major.

Radical Aerocar Designed for All-Purpose Flying





An open and folded view of the proposed helicopter. Inset, Wilbur G. Nelson, the designer.

ON OUR cover this month, we show a helicopter that has been perfected in Pueblo, Colorado by Wilbur G. Nelson.

The "aerocar," as this design has been named, has no wings nor propellers, but instead has two sets of "revolving planes" from which the cabin is suspended. The air flivver weighs only 450 pounds, travels 50 miles on a gallon of gasoline, will reach a maximum speed of 100 miles an hour and can be manufactured to retail at less than $500, according to the inventor's figures.

The aerocar needs no landing field and for a hangar any ordinary garage is large enough, because the "revolving planes" fold and drop to the sides of the craft. The "garage" can be on a housetop, providing the roof is flat.

The revolving planes travel at exactly the same speed in opposite directions, keeping the ship upright without mechanical or human aid. The cabin can assume no position except an upright one, thus eliminating tail-spins, nose-dives and other dangers. Even should the motor stop in mid-air the vacuum above the rotating planes will lower the craft as gently as if by parachute.

As the control is similar to an automobile steering wheel, and as no special training in aeronautics is required, anyone can manipulate the aerocar.

Whirling of the planes in a horizontal position raises and lowers the air flivver. Tipping them forward causes the ship to change from a vertical to horizontal line of travel. The revolving planes cut the air much faster than the wing of an ordinary airplane, thereby giving more lift per square foot of plane surface. It is expected that this will reduce the power requirement to such an extent that a 30-horsepower high speed motor will be ample for a three-passenger ship with a total weight of 1,200 pounds.

Tests have been successfully made by the inventor, but only his few backers were permitted to view them or inspect the test ship. It has been dismantled while further patent protection is being obtained. Within a few months a Nelson aerocar will be built for a transcontinental flight.

Cleveland Wins Air Race Contract

THE national air races will be held annually in Cleveland for the next ten years.

This was the simultaneous announcement of Senator Hiram Bingham, president of the N. A. A., and Mr. L. W. Greve, president of the National Air Races, Inc., of Cleveland, following their recent signing of an agreement.

For the past ten years the National Air Races have been held in ten different cities, namely: Omaha, Detroit, St. Louis, Dayton, New York, Philadelphia, Spokane, Los Angeles, Cleveland, and Chicago. With each city trying to outdo its predecessors, the cost of staging the races has mounted to over $600,000 for Chicago in 1930.

With the increased cost has come the need for the greatest possible gate receipts. It is a significant fact that only Cleveland and Chicago returned a financial profit though all the cities benefited of course through advertising and publicity.

It is believed that while other cities may have advantages, in certain respects all of the ideal requirements for holding the national air races are more effectively combined in Cleveland than in any other city. These include such important considerations as central location in area of large population with demonstrated civic interest and capacity to handle the races successfully; size, accessibility and status of airport; and cooperation of city government, metropolitan newspapers, Chamber of Commerce, hotels, transportation agencies and civic leaders.

In all probability the races will continue to be held during the week or ten days closing with Labor Day of each year.

To Fly or Not to Fly

THE weather man at the airport must not be held responsible for determining whether or not a pilot should make a scheduled trip, according to James H. Spencer, U. S. government weather observer in Buffalo, N. Y.

"In nine cases out of ten the weather man is not a pilot, and although he may be a good weather forecaster, only a pilot can know just what strain his ship will stand, or whether the wind, rain or snow can be battled successfully at a given time.

"In water travel, the weather experts furnish hurricane warnings and other weather data to marine operators, but sailing decisions are left with ship masters and shipping company officers," pointed out Mr. Spencer. "It should be the same in aviation."

My Experience With a Hang Glider

LAST spring two of my friends and I organized the Pioneer Glider Club of Montreal. We immediately started the construction of a hang-type glider.

It performed extremely well for one of that type, affording a gliding-angle of eight to one. The framework was made entirely of white pine. The wings were single cambered surfaces, covered with cambric cloth that was made taut and air-tight with a solution of starch and water. The completed glider weighed about thirty-five pounds.

To take-off it was necessary to face into the wind and run towards the brow of the hill. The speed of the glider rarely exceeded top running speed.

Our glides never exceeded one hundred yards, as the hill was not a high one. This glider should not be flown in strong winds, for there are no control surfaces.

The breaking of this rule brought our glider to an end, when a strong gust caused it to sideslip at an altitude of fifteen feet. The Club decided not to repair it, but to start work on another glider with at least a seat in it. —Wilson Hammond, Montreal, Que.

How I Got Into Aviation

by PAUL W. CLOUGH*

At 13 the author had his first ride. At 17 he won fame by establishing a new altitude record for lightplanes. The vivid story of his persistent struggles to get into aviation is an inspiration to the young men of America.

IN THE Spring of 1927, I first started to go over and just hang around Roosevelt Field watching the flyers take off and land, taxi around the field and work over the engines.

I only lived about a mile and a half away so it was only a short bicycle ride and easy to get to the place which held my greatest interest. I rode over almost every day after school and on Saturdays and Sundays, and, naturally, soon began to become acquainted with some of the pilots and mechanics.

I was just thirteen and at that age it is hard to get people to pay much attention to you. But I was always ready to run errands and do anything they would let me. They seemed to find that I was not a nuisance, so I pretty much had the run of the place.

My particular hang-out was the hangar of the Fairchild Airplane Company. They kept a few ships, two pilots and two photographers. The first pilot to become real friendly with me was Dick Pears, who later gave me my first ride. Dick is a fine pilot and has been flying a long time and had many interesting experiences, to which I listened with the deepest interest.

The regularity of my appearance must have convinced him of my real interest in airplanes. I used to help him clean up the ships and asked loads of questions, which he patiently answered.

One morning in July of that summer I came puffing up on my bike (I always rode as fast as I could to get there quickly so I wouldn't miss anything), Dick asked me how I would like to drive out to the Fairchild factory at Farmingdale and fly a ship back with him.

I was so surprised and thrilled I couldn't speak, but rushed my bicycle into the hangar and climbed into his car. On the way out of Curtiss Field, now Roosevelt Unit No. 2, we picked up a friend of his to drive his car back. When we reached the factory, about fourteen miles away, Dick went in and I stayed in the car with his friend. The ship he was to take to the field was outside. It was the first Fairchild type, an FC 1 with an old Wright Whirlwind J4 motor of 200 H.P. This plane first had an OX 5 motor.

I waited in the car a few minutes, then the friend said he guessed he would be going back. I was worried because Dick had said he wasn't sure he could take me, but his friend said, "Oh, he'll take you back in the ship," so I got out and he drove off.

Of course, I was very glad because I then felt sure of my first ride. In a few minutes Dick came out and said, "Let's go." He warmed up the motor and I climbed in; he taxied out and we took off. The ground seemed to drop away from us. I could see the hills on the north shore of Long Island as soon as we got over the houses and trees. He climbed up to two thousand feet and by that time I could see New York City to the west, the hills of Connecticut to the north, and way out on the ocean east and south.

This picture of young Clough was taken after his successful altitude flight. Many will recognize this view as having appeared in the movie news reels all over the country.

He called my attention to the altimeter and I was quite surprised because I though we must be much higher. Then he showed me the air speed, which read one hundred and twenty miles per hour. That surprised me too. We seemed to be going much slower.

This is always so with beginners because you have no way to judge your speed at that altitude. If you fly about fifty or a hundred feet above the ground you can better judge your speed by the passing of trees and houses, because these are the things we are used to for judging speed.

AFTER flying about ten minues we passed over Curtiss Field, then he cut his motor and glided down to a perfect landing. Was I thrilled? My decision to learn to fly was made right then.

After thanking Dick, I raced home for lunch and to tell the news. When I first told my mother she was quite excited, so much so she forgot to be angry with me for going without permission. I told her how fast and how high I had been, and, of course, it seemed terrible to her.

I swallowed my lunch to hurry back to the field, but before I left I had to promise not to go up again that day, to which I agreed, because I didn't expect another chance so soon, anyway. From that day to this I have missed very few days at the Field.

That first ride filled me with a world of new questions to ask, so I asked them, and the pilots and mechanics were very kind and patient with me and answered them all. I tried to increase my usefulness at the hangar, and they gradually let me do more things, such as gasing and oiling ships. At first, everything I did was checked by someone, but they soon began to depend on what I said had been done or how much gas a ship had, etc.

A few weeks later another chance for a ride came and, of course, I didn't refuse. This time we flew around for about half an hour, over the north shore.

My first ride in an open ship was

* Private pilot. Holder of American lightplane altitude record for ships weighing less than 440 pounds.

also with Dick Pears in a Waco, powered by a Fairchild-Caminez motor. This was quite different from a cabin ship because of all the wind. I didn't have a helmet or goggles and when I went to comb my hair I either pulled out a lot of hair or pulled the teeth out of the comb. The wind certainly can tie your hair in knots when it comes at you thick and fast.

The next pilot with whom I flew was Everett Chandler, or "Chan," as everyone calls him. He is also a great pilot. Both he and Dick Pears are army trained, having graduated from Brook and Kelly Fields in Texas.

They both told me never to go up with a pilot I did not know — not to be so anxious for a ride that I would go up with anyone, who might be a very poor pilot or a student, because that might be bad for my health. Taking their advice, I have never tried to get a ride with a pilot until I knew him quite well.

A recent picture of private pilot Clough, lightplane altitude record holder, and now Junior Activities Editor for Popular Aviation.

After having a few rides, I decided to keep a log book of all my rides, recording the type of plane, and motor, name of the pilot, and time and place of the trip, and its purpose. This is quite interesting to read over after even these few years.

One day Richard Depew, Sales Manager of the Fairchild Company, who was to fly to the west coast, came over to test-hop the ship to see that it was all right for his trip. He took me up and after a few minutes motor trouble developed so we landed at Mitchel Field, the Army Field, about two miles from Curtiss. This was my first forced landing. I didn't mention it at home.

My first few rides did not take me above two thousand feet, but one day I was up about four thousand. When I told Mother she thought that was much too high for me to go, as I might get hurt more easily. She told me not to go so high again. She has gotten over that now.

IN JUNE, 1928, Col. Lindbergh came out to the Fairchild hangar to fly a new Fairchild, not having tried one before. Dick Depew, who loaned him the ship, asked if he would mind taking me and another fellow who worked in the hangar. He readily agreed, and I

(*Concluded on page* 52)

JUNIOR ACTIVITIES
Edited by Paul W. Clough*

THIS column will be published monthly and contain all the news I can obtain for you about the activities of Junior Pilots and Students. I would appreciate it if any boys or girls under twenty-one who are pilots or students or otherwise taking an interest in aviation will write me in care of Roosevelt Field, Mineola, N. Y., or care of POPULAR AVIATION, telling me what they are doing and of their experiences.

* * *

Stanley Brown, 17, of Garden City, L. I., who attends Culver Military Academy, was home for the Christmas Holidays. This is Stanley's third year at Culver. He had his first ride in 1923 in an old Rogers Boat. He flew quite a bit after that with the famous "Casey" Jones. In July, 1928, Stanley flew from what was then Curtiss Field (now Roosevelt Unit No. 2) to Old Orchard, Me., in a Stinson bi-plane with Harry Jones. This was his first cross-country trip and on it he had his first experience handling a ship in the air, as it was equipped with dual controls.

Last summer he first started his actual flying lessons, and before he had to return to Culver in the Fall he had received his Private Pilot's License. He told me that his father promised to give him a ship as soon as he gets through Culver and we all wish him luck. Of course, Stanley couldn't get in any time while at school, but he has been making up for it over the Holidays.

* * *

Jake S. Fassett, 17, of Woodmere, Long Island, recently soloed after only two hours of instruction at the Roosevelt Aviation School. His instructor was Lester "Husky" Flewellyn. Naturally I think Husky is a great instructor because he taught me. Jake had his first ride with Pete Brooks in 1927 in a Travelair. Last summer he flew gliders at the Cape Cod Glider School. He goes away to school, so he will probably have to wait for vacation to complete his time for his license.

* * *

Al Robbins, 18, of Roosevelt Field, is planning a non-stop flight from New York to Miami. He will use a J-5 Stearman, with a gas capacity of one hundred and eighty gallons. Al had his first ride way back in May, 1920, in a Jenny. Capt. E. D. C. Herne, a skywriter and war ace, taught him to fly in October, 1927. In July, 1928, he started on a long tour in a Hisso Eaglerock, but the trip ended when he was forced down because of a broken oil line. The ship was damaged when he set it down, but he wasn't. Al has had 456 hours and most of it has been cross-country.

* * *

George Dade, 18, of Garden City, Long Island, has been taking his flying very easy lately. We will have to get after him to do something for his country.

* * *

Eddie Schneider, 18, former holder of the Junior Trans-Continental record, is planning a solo round-the-world flight next summer. He will use a Bellanca. We certainly all wish him the best of luck and "Happy Landings."

*See footnote preceding page.

Major Overhaul Wins Dumbbell Trophy

FROM Mitchel Field comes the following communication:

"In order that knowledge of such deeds of valor are not lost to posterity, the Mitchel Field Flying Dumbell Club, in executive session, has conferred upon Major Overhaul, Air Corps, the great and questionable honor of inscribing his name upon the Club's emblematic trophy and has selected him its first life member.

CITATION

"For exceptionally meritorious and distinguished conduct and extraordinary heroism in the Long Island sector. As commander and pilot of a strange O-A2 Keystone Amphibian airplane, Major Overhaul, Air Corps, operating between two and three thousand feet altitude, planned and executed a series of wing overs, power dives, chandelles and gliding turns, thereby demonstrating high attainments in flying.

"At the conclusion of these maneuvers for the instruction of the flying personnel of the Ninth Observation Group, Major Overhaul then demonstrated his brilliant command of skill and judgment and with conspicuous intrepidity above and beyond the call of duty and regardless of personal danger, brought his airplane to a perfect one point landing on Mitchel Field without lowering or making use of the landing wheels attached to the airplane for this purpose."

A formal presentation of the Dumbbell Trophy to a Flying Cadet at Kelly Field.

Quick Thinking Saves Young Aviator's Life

ALLAN HARWOOD who lives near the little village of Donnellson, Illinois, is determined to make aviation his life's work and though barely out of high school, is well on the road toward realizing his ambitions.

Harwood just completed his high school course in the spring of 1929 but he has been flying for the past four years. In fact, he had completed the course of a nearby aviation school long before he finished the regular high school course in his home town. His solo and stunt flying has long since become an old story to the residents of his community.

What young Harwood's plane looked like after he landed in the trees.

The young aviator declares he has experienced many thrills during his hours in the air but none that exceeded that of the mishap shown here.

On this occasion, Harwood was flying low over the village of Donnellson when a clogged fuel line forced him to make a quick and hazardous landing. Since he had no time in which to choose a landing spot that was clear of obstructions he did the next best thing and headed his plane into the top of one of the tall trees growing in the school yard.

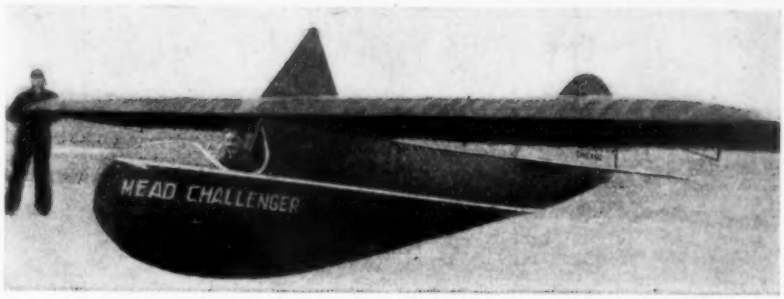
This quick thinking undoubtedly saved the young aviator's life for, while the fuselage and one wing of his plane were completely demolished, he came out unscathed.

New Device Used to Crank Airplanes

MUCH interest is being centered in a unique apparatus, an "external energizer," so called, just received at the Army Primary Flying School.

This energizer is being used in cranking airplanes not equipped with electric starters. It attaches directly, from an electric outlet installed on the airdrome (by the same principle as an electric iron is operated) to the crank fitting of the hand inertia starter. The energizer can be operated by one man, and materially accelerates the starting of a plane without the output of undue physical exertion necessary with the use of the hand crank.

It is hoped that the new equipment will prove of such satisfaction that the old method of hand cranking can be dispensed with.



A view of the new Mead Challenger, a secondary glider with the characteristics of a soarer.

Convert Your Rhon Ranger to Advanced Type

ALTHOUGH this glider is claimed to be only a secondary type glider, it has many characteristics of a soarer.

It is not an entirely new design throughout, but is constructed around the Mead Rhon Ranger, a primary glider. This advanced type glider thus can use the standard wings as in the primary type, although an additional center section can be installed which adds about 8 feet more wing spread.

The most important change has been in making a streamlined fuselage to cover the skeleton of the primary glider. The converted glider also has slightly larger tail surfaces than the primary.

Other interesting features are the landing and flying wires, with a streamlined cabane, rather than the more conventional wing strut equipment.

Mr. Mead claims that the use of wires instead of steel struts cuts down several pounds of dead weight, and reduces head resistance. He also says that the combination of wires will not give way in a hard landing as quickly as long struts.

The completed "Challenger," the name given this new glider, has a very complete cockpit. There is a plywood instrument panel directly over the control stick, which has a stop watch, release ring, and an inclinometer.

This new glider can be built around the primary glider, construction plans of which recently appeared in POPULAR AVIATION. Those who built or who own the primary type can easily convert their gliders to this more advanced type.

England Will Keep World's First Airplane

GREAT BRITAIN may retain forever the Wright Brothers' original airplane.

Two years ago the famous plane, which is considered the most valuable aviation treasure in the world and one for which it is reported Henry Ford would gladly pay two million dollars, was placed on display in London at the Science Museum.

The museum officials are extremely anxious to retain it and are making every possible effort to gain absolute possession of the craft, which now hangs suspended from the archway into the aviation exhibit of the museum.

The airplane is the prize entry and occupies the most conspicuous position. Hanging above the reach of eager fingers, it appears like an overgrown box kite. Wings seem frail and the body anything but strong. The familiar sight of Orville Wright lying on his stomach as he guided the model is represented by a figure dressed in a gray cap, gray and white checked tie, brown leather gloves and a black coat.

Underneath the Wright Brothers' machine a printed description relates that the airplane was used on December 17, 1903, at Kitty Hawk, North Carolina, as the first power-driven man-carrying airplane to make a free, controlled and sustained flight. The famous picture of the plane taking off on the downhill wooden runway also appears.

Lilenthal's 1895 glider, Weiss' model glider, a model of Wright's biplane used in the autumn of 1908 at Le Mans, France, and Bleriot's 1909-1910 type monoplane, are but a few of the aviation treasures found in the exhibition.

Models of every type of airplane used during the war are arranged in numerous cases. The Vickers-Vimy Rolls Royce plane, used by Captain John Alcock and Lt. Sir Arthur Whitten Brown to make the first transatlantic flight on June 14 and 15, 1919, is fastened to two huge concrete blocks.

One of the most interesting exhibits is Frost's Ornithopter, built in 1902. It resembles a huge eagle without a head. The wings consist of seventeen feathers which are as near to nature as the inventor could make them. Each wing spreads eight feet from the hinge point and the total area is approximately fifty-four square feet.

HOW I MADE A NEW WORLD'S RECORD
by JUANITA BURNS

IT WAS a severe battle, but I have broken the world's altitude record for women. I'm sure I reached 28,000 feet and I may have gone to 29,000 feet, for after the third altimeter in my ship stopped working at 26,000 feet I climbed steadily for about a half hour.

After about the 25,000 foot mark it was a fight all the way, because the ship kept slipping off in the extremely thin air, first on one wing and then on the other. Once or twice I dropped 2,000 feet before the air got heavy enough to pick me up again, but I didn't spin and I didn't lose consciousness at any time during the flight.

I took off from the Lincoln Air Lines Port in Los Angeles at 11:37 a. m. on December 28. My high winged open monoplane, called the "California Cub" was a stock plane built by the California Aircraft Corporation. It was powered with a 90 horsepower Lambert radial motor.

I headed for the high mountains back of San Bernardino so I could take advantage of any updrafts that might be caused by the peaks. I would climb up on one of these until it lost its support and then head in another direction and catch another.

My motor was not supercharged and naturally lost power in the thin air. But it worked beautifully, and I had the ship in perfect control at all times.

It was so cold during the last few thousand feet of altitude that my breath formed little icicles on the outside of my face mask. Guess it was way below zero. At about the 24,000 foot mark the one tank of oxygen in the ship ran out. I was on my way down, and you can imagine that I wasted no time in getting back to where I could breathe normally.

Miss Juanita Burns inspecting the sealed barograph upon her return to earth after setting a new world's altitude record for women.

On my final climb when I really believe the ship reached 29,000 feet it was at its absolute ceiling. The plane stood still in the air—the propellor churning.

I had three altimeters aboard. They registered 19,000 22,000 and 26,000 before they stopped recording. I didn't have a parachute because I felt that the extra thirty pounds of weight might have meant 1,000 feet or so in rare air.

I was in the air exactly two hours and forty-three minutes, and although I am not tired, I have a couple of pains in the back of my neck. I expect these are caused by being without oxygen for a few minutes on my downward flight.

It certainly is great to be back on earth! But I'm thrilled about my record.

[*Miss Juanita Burns is 24 years old and lives in Los Angeles. She has been flying for three years. A few months ago she succeeded in locating a missing Western Air Transport in the San Bernardino mountains after scores of men pilots had failed in the attempt.—Ed.*]

Some Details of the Focke-Wulf Hawk

The Hawk is a five passenger monoplane powered with a 120 h.p. Wright engine.

KNOWN as the "Hawk," a new type of plane, made by the Folke-Wulf Airplane Manufacturing Co., made its appearance recently. The Hawk differs from the conventional plane by having wings that curve in a manner similar to the Rumpler pigeon plane of 1912, and, as a result of this new design, the ship is said to be proof against "staggering" when falsely steered or when rough air is encountered.

The Hawk is a 5-passenger monoplane, and is powered by a Wright 120 h.p. radial air-cooled engine. The fuselage is constructed of riveted steel and duraluminum tubing, with steel fittings. It is designed for being catapulted in the air, if desired, and with movable wheels for the ordinary landing on deck or ground thereafter. The undercarriage consists of two wheels hinged to the bottom fuselage longerons and two half axles hinged to a part of the under-fuselage. Hydraulically operated wheel-brake shoes bear on the inner surface of the wheel rims.

The main gasoline tank is carried in the fuselage, and it is provided with an emergency dumping valve for the purpose of lightening the machine and providing extra buoyancy in case of forced landing.

Will the Airplane Ever Be Silent?

THAT the silent aircraft is within the bounds of possibility is shown conclusively by Mr. M. D. Hart in a report to the British Aeronautical Research Committee. Theoretically, a silent airplane could be built today, if certain precautions were taken in constructing and installing the engines and the exhaust systems, and if a certain type of propeller were employed.

The greater part of the noise heard when an airplane passes is caused by the engine and the prop.

Two notes of equal frequency and intensity will suppress each other in certain conditions. Thus the theoretical silent plane imagined has an exhaust pipe connected with narrower pipes of unequal length, these lengths being calculated on the type of engine used and the number of revolutions a minute at which it runs. The result is a mutual cancelling of the sounds emitted and a practically silent engine.

The principle of interference governs propeller design and the blades are so arranged that the noises they make cancel each other out. The ideal silent airscrew is found to have four thinnish blades arranged in the shape of a letter "X."

A New System to Facilitate Airship Handling

A NOVEL communication installation designed to meet certain needs peculiar to airship handling has recently been tried out at the Naval Air Station, Lakehurst, N. J. It consists fundamentally of an unwired portable loud speaker system.

The purpose of the loud speaker equipment is to provide satisfactory and efficient communication between the units involved in the mooring and handling of large rigid airships on the ground.

Mounted permanently on the mobile mooring mast there are located six loud speakers. The sound emanating from the loud speakers will come from an amplifying receiving set mounted on the mast.

Three portable high frequency transmitters are provided, one in the airship, one for the mooring officer, and another for an assistant mooring officer. These transmitters are only about twelve pounds each in weight, and are designed to be carried about by the personnel using them.

If the ship desires to communicate with the ground crew, it is done by means of the ship's transmitter, the message being picked up by the receiving set on the mast, the spoken order from the ship being projected through the mast loud speakers.

If the mooring officer desires to communicate with the ship, his message is transmitted through his own port-

(*Concluded on page* 53)

How to Build the Heath Parasol

Part III. Completing the Wing

Specially written for POPULAR AVIATION by

E. B. Heath.

THIS month you are really going to be busy. Mr. Heath is going to present two installments this time, the first one will complete your wing by adding the ailerons and the gas tank to the wing you now have built. The covering of the wing will, of course, not be done until the entire plane is finished.

Besides finishing all construction work of the wing, the work on the fuselage will be started.

As was mentioned at the beginning of Mr. Heath's articles, the fuselage construction will be of the bolted type, rather than of the welded type since few amateur builders are equipped to do welding.

For those readers that want to construct a welded fuselage, POPULAR AVIATION can supply them with a special set of instructions of Mr. Heath's at a very nominal cost. Although Mr. Heath does not offer these welded instructions for sale ordinarily, (they are intended to be included only with the purchase of a welded type kit) he will give them to the readers who want to build this type fuselage.

The bolted type construction which will be followed in POPULAR AVIATION is of the very latest design. Mr. Heath points out that it is much simpler, and at the same time stronger, besides being more economical. One is immediately impressed with the absence of the usual large number of guy wires, etc., that are used in the ordinary home-built plane.

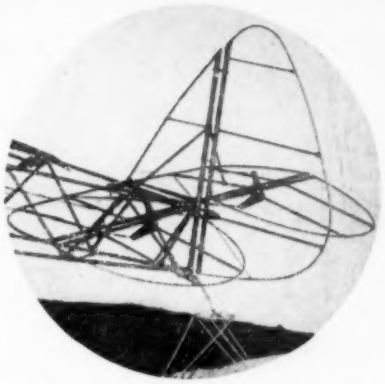
The accompanying photographs show not only a view of the skeleton tail section, applying to the two groups presented this month (see wing picture in January issue of POPULAR AVIATION showing the gas tank and aileron of an uncovered wing), but also show several views of Heath planes in action.

We hope that at this time next year you will be flying your own plane and can send us some similar pictures.

An Unsolicited Testimonial

I have helped several fellows get their Heath balanced and checked before the test flight and have never seen one that would not fly if the plans were followed.

—Alvia Peters,
Popular Aviation Reader.



A skeleton view of the tail surfaces of a Heath Parasol.

AILERONS AND GAS TANK

by E. B. HEATH

THIS group completes the wings except for the fabric covering, which to avoid tears should not be put on until the plane is completely built.

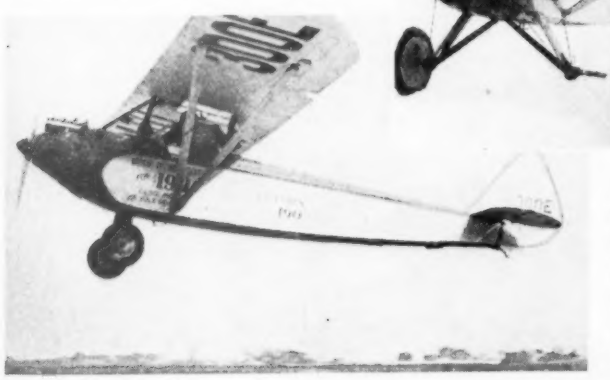
No additional tools are needed, but the following materials will be required:

V–38. 2 No. 324 L. F. turnbuckles (aileron control).
V–39. 2 7/16"x3/8" clevis pins (for item V–38).
V–55. 50 ft. 1/8" flexible cable (control cable).
V–71. 2 No. 3 5/8" wood screws (fastening leading edge to nose of butt ribb).
V–74. 10 1/8" thimbles (aileron cables).
V–75. 1/4 lb. tinned serving wire.
V–76. 1 swivel snap connector (aileron cable).
V–77. 4 pressed steel shackles (aileron cable).
V–78. 4 clevis pins 7/16"x3/8" (for V–77).
V–79. 6 in. 1/16"x22 ga. (.028) steel tubing (drift wire spreader).
V–85. 2 pieces 6' 8" ea. 1/16" x 22 ga. (.028) steel tube.
V–86. 6 pairs hinges, clevis pins and nuts.
V–87. 18"x3"x16 gauge (.065) sheet steel (aileron horns).
V–88. 8 7/16"-hole washers (aileron horns).
V–89. 20 No. 4 5/8" wood screws (for aileron spars and stiffening strips).
V–90. 12 7/16"-hole washers (for hinges).
V–91. 14 in. 1/2"x18 gauge (.049) steel strip.
V–92. 4 8/32 1/2" R. H. M. S. nuts and washers.
V–93. 20 ft. spruce 3/32"x3/32" strips.
V–94. 10 ft. 7/16"x7/16" spruce (bracing).
V–95. 2 pieces 6'3" each spruce, 3 3/4"x 1/4" (aileron spars).
V–96. 1 piece 8"x7"x1/8" plywood (horns).
V–97. 11 ft. 1"x3/8" spruce (stiffening strips).
V–98. 20 ft. 5/8"x3/4" spruce (filler strips).
V–99. 25 sq. in. 24 gauge (.020) copper strip.
V–100. 4 No. 3 wood screws (aileron spar).
V–145. 1 piece 24"x36" ternplate.
V–146. 1 filler cap and neck.
V–147. 1 ft. 5/8"x16 ga. (.065) sheet steel (tank lugs).
V–148. 1 7/16" 29 E. F. shutoff cock.
V–149. 7 ft. 7/16" copper tubing.
V–150. 2 in. 5/8"x22 gauge (.028) steel (rib stop).
V–151. 4 No. 4 3/4" wood screws.
V–152. 2 6/32" x 3/4" long M. S. and nuts (side lugs).
V–153. 2 1/8" washers (for Item V–152).
V–154. 4 in. 5/8"x18 ga. (.049) steel (side lugs).
V–155. 1 right gas tank feed sump.
V–156. 1 drain plug and flange.
V–157. 10 ft. 1/2"x3/8" spruce (reinforcing posts).
V–174. 1 gasoline gauge.
V–175. 1 gas gauge tank flange.

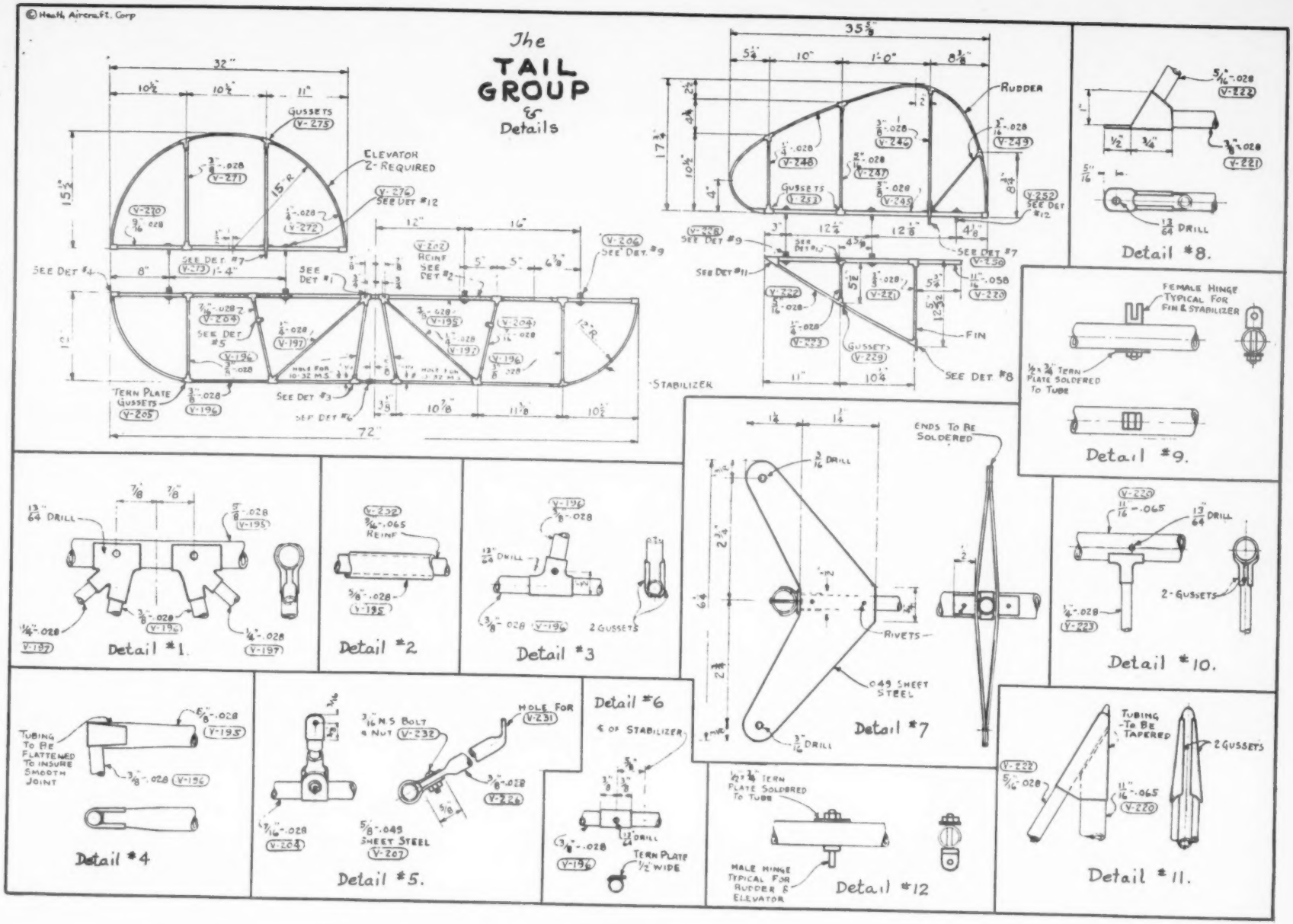
Procedure

TO PROTECT those few remaining rib ends, you will now build your ailerons. First mark a line exactly 5/8" from the rear of the rear spar on the top edge of each of the five aileron ribs. Also mark a line exactly 1 3/8" from the rear of the rear spar on the bottom edge of each of these ribs. It is at these points that you will later saw the aileron free from the wing.

Next take an aileron spar, (V–95) square up one end and taper the other according to your aileron print. Note



Above, E. B. Heath out in the cold to change a wheel on his Heath Parasol. Left, the remarkable qualities of this ship are shown by its ability to take off with two passengers. E. B. Heath is in the cockpit, the extra passenger hanging on.


© Heath Aircraft. Corp
The TAIL GROUP & Details
GUSSETS V-275
ELEVATOR 2-REQUIRED
SEE DET #12
SEE DET #7
SEE DET #4
SEE DET #1
SEE DET #2
SEE DET #9
SEE DET #3
SEE DET #6
TERN PLATE GUSSETS V-205
STABILIZER
RUDDER
GUSSETS V-251
SEE DET #8
SEE DET #11
FIN
GUSSET V-229
Detail #1.
Detail #2
Detail #3
Detail #4
Detail #5.
Detail #6
Detail #7
Detail #8.
Detail #9.
Detail #10.
Detail #11.
Detail #12
HOLE FOR V-231
TERN PLATE SOLDERED TO TUBE
MALE HINGE TYPICAL FOR RUDDER & ELEVATOR
FEMALE HINGE TYPICAL FOR FIN & STABILIZER
ENDS TO BE SOLDERED
RIVETS
.049 SHEET STEEL
TUBING TO BE FLATTENED TO INSURE SMOOTH JOINT
TUBING TO BE TAPERED
2 GUSSETS

A well-built Heath Parasol is a cinch to carry around with you. After you have built yours, try it.

that there is a slight taper on the bottom edge. Saw off to a length of 73½". Cut from V–97 a length 63", taper each end for a distance of 12" to a thickness of ½".

Draw a center line the full length of the aileron spar on both sides. Glue, and nail at the end, the stiffening strip (V–97) edgewise on that line, with one end flush with the butt end of the aileron spar. Remember that the strip goes on the side which will be inside the aileron. Turn the spar over and from its back, put ten screws (V–89) into the stiffening strip.

Take item V–98 and saw two pieces 59¾" long. With a plane remove one corner so that when you have finished you have two long triangular pieces (roughly ⅝"x¾"x1"). Glue and nail the narrowest side (⅝") of each of these pieces along the same side of the spar as is the stiffening strip. Attach one to each edge at a distance of ⅛" from the edge and with the ¾" side outward. One end of each piece must be flush with the butt end of the aileron spar.

Clamp, glue and nail these pieces and let them stand twenty-four hours to dry. Repeat on the other aileron spar. Once the stiffening members are attached, the aileron spars are no longer interchangeable but are definitely right or left aileron spars and belong to the right or left wings. Accordingly exercise care to attach these strips to the proper surfaces.

When the first aileron spar is dry, have someone hold it while you place the spar butt against the side of one of the aileron ribs, at the proper slant indicated by the marks which you put on the rib top and bottom edges as described in the beginning of these instructions.

Be sure that you have the side with the stiffening strips toward the trailing edge of the ribs. When placed correctly the upper corner of the spar will meet the edge of the rib top cap stripping and the lower corner of the spar will project about ¼" below the rib bottom cap stripping.

Draw on the aileron spar butt two diagonal lines paralleling the inside of the rib cap stripping top and bottom. Remove the spar and extend the lines for the full length of the spar, on the spar and on the filler strips. With a plane cut down the corners to within ⅛" of these lines. Try in place for fit and if necessary remove more wood.

When the spar is properly sized, slip it into place and glue and nail the ribs top and bottom to it. The aileron spar butt should be ⅜" from the side of the seventh rib. Make a butt rib for the aileron of 3/32"x⅝" spruce and brace internally like the other ribs. Glue a small block in the tip. Mark carefully on the aileron spar top and on the rear wing spar top the positions for the hinges. See wing print (January issue of POPULAR AVIATION).

Aileron Trailing Edge

THE aileron trailing edge presents no difficulty. Trim all of the rib ends so that they line up with one another and have a terminal thickness of 1/16 of an inch. With a rat tail file put a groove in each rib end to receive the tubing (V–85) which forms the edge.

With some 1/16" plywood (V–17, group No. 3, January issue of POPULAR AVIATION), reinforce the sides of the tapered tip of the aileron spar for a distance of 2". Sandpaper the edges.

Take one piece of 1/16" tubing (V–85) and 1/16" from one end, drill a 3/32" hole for a #3x¾" flathead wood screw (V–100). This end will be attached to the aileron spar tip. Bend the tubing as you did for the wing tip, to its proper curve and at the point where its other end touches the aileron butt rib, drill another 3/32" hole.

Draw in the tip of the aileron butt rib ⅛" so that there is a clearance of ½" between it and the side of the adjacent rib. This is done so that when the wing and the aileron are covered the thicknesses of cloth will not cause rubbing or binding.

Saw off any excess tubing. Screw both ends of the tubing in place and fasten, as you did the wing tip, with copper strips (V–99) to each rib end and to the spar tip. (See detail #4, aileron print).

The copper strips adhere more readily to the steel tubing if both the under side of the copper strips and the tubing are "tinned" (given a light coat of solder) before nailing the strips in place. Be sure to solder over the nail heads, so that they will not loosen.

Item V–94 supplies material to cross brace the aileron butt rib as shown in your print and for a brace from the aileron horn to the trailing edge. Item V–93 is used to fill in between the ribs on the top and bottom edges of the spars so that when the cloth is stretched over the aileron a smooth corner is obtained.

Allow to stand overnight for the glue to dry. The aileron is now completed and may be sawed free from the wing. Fill in on the rear wing spars, top and bottom edges between the aileron ribs, as you did on the aileron spar, with 3/32" cap stripping (V–3, group 1, December issue of POPULAR AVIATION).

At the points which you have marked for the hinges, drill 1/16" holes at the angle shown in detail #2 (aileron print). It will be necessary to nail and glue a small beveled block on the inside of the wing spar at each hinge point, so that the nuts may be drawn up squarely.

A corner guard is made from V–91 and applied as shown in detail #2, being held in place by the hinge. Insert the hinges (V–86), put on the washers, draw up the nuts (V–90) snugly and burr the threads so that the nuts will not work loose.

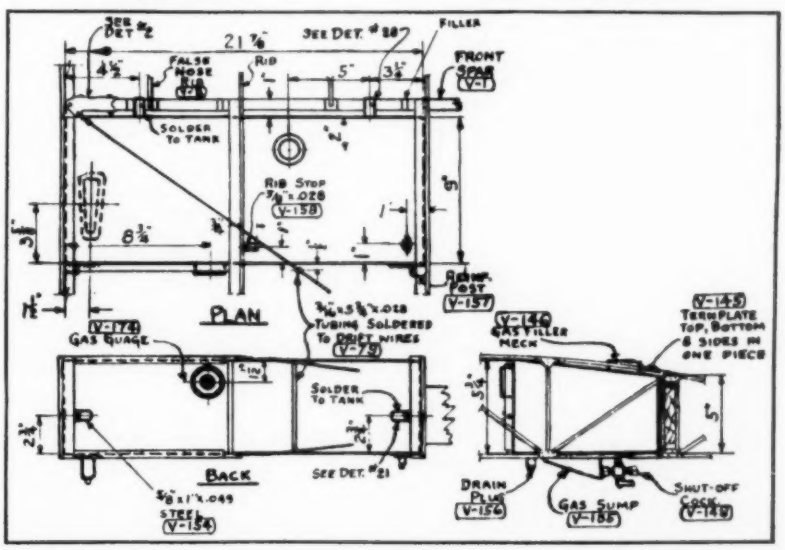
Aileron Horns

THE aileron horns are cut from item V–87 with a coping saw to the shape and size indicated in detail #1 (aileron print).

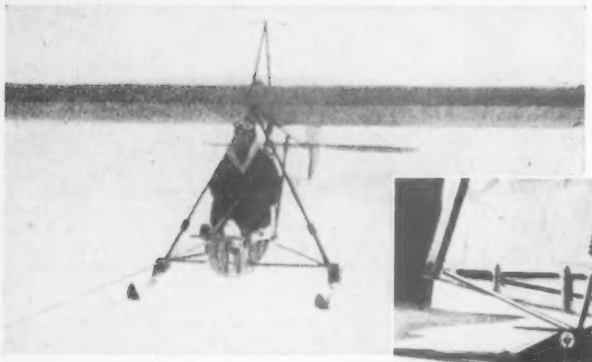
Note that the detail shows the horn fully shaped, with the attaching lugs bent to position. The fitting in its flat shape, therefore, occupies a space 2¾"x 8". Drill two holes 11/64" in the lugs and one hole 1/16" in each horn tip. Solder over each of the last holes, a 1/16" washer (V–88).

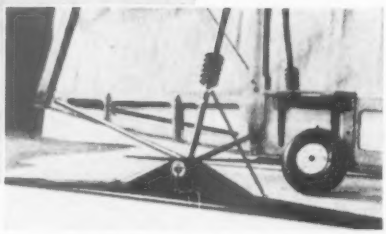
(*Continued on page* 56)

Detail No. 8.



Primary Glider Equipped with Skiis





Left, front view showing ski mounting. Below, close up view of right - hand ski with wheel which has just been removed.

THIS skii equipment on a Rhon Ranger is the very latest development in landing gears for gliders. It is quite a simple arrangement, since skiis are merely mounted on the regular landing gear, instead of wheels.

The skiis are not fastened rigidly to the landing gear, but are free to move easily on the hubs. A strong spring is connected 8 inches in front of the hubs, in order that the skiis will not tip forward when the glider is in flight. A plain wire is connected just behind the hub of each skii, so that the spring will not pull the front of the skii too high.

This kind of skii rigging is so flexible that landings are easy to make when coming down at almost any angle.

The advantages of using skiis are the same as using a 2-wheel landing gear on plain ground. It enables one to be towed back and forth across a field and get the "feel" of the glider before actually getting into the air.

Skiis are of course much better in snow than wheels, for besides making the towing easier, skiis are safer in landing, as they do not sink down into the snow.

WHAT I LEARNED ABOUT GLIDING

by W. A. BUTCHER

Winner of 1st prize in POPULAR AVIATION's Contest for building the Rhon Ranger

THE following information has been gained from the actual experience of one who had never previously handled the controls of either a powered plane or a glider.

Of the two accepted methods of launching, that is, by shock cord, or towing by an automobile, the latter is undoubtedly the best for the raw beginner. It enables him to be towed across the ground slowly at first until he has become accustomed to the aileron and rudder controls which are most important, especially the rudder.

A good level field, which is smooth enough for a car to be run up to 25 m.p.h. should be chosen. It should be free from trees and brush and should be at least a quarter of a mile long.

On no account should a start be made if there is more than a 6 or 8 m.p.h. breeze and not even then if it is at all gusty. Have about 200 feet of quarter inch rope and always start off heading directly into the breeze. Do not tie the rope to the tow car, but take one turn round the bumper and let an assistant ride on the running board and hold the free end. In this way the rope can be released immediately if the student gets mixed up.

A releasable hook on the glider is good, but the student will find that he has plenty of other things to think about on the first few trips.

The safety belt should be adjusted to fit snugly. Do not try to balance the glider with the body; sit upright and get comfortable before giving the OK signal. An OK signal should be arranged and on no account should a start be made until the student himself has given this signal.

Take up the slack in the rope and see that the stick is in neutral before starting. One man must hold a wing tip until a little speed has been attained. Do not exceed 10 or 12 m.p.h. until aileron and rudder control is perfect.

At least six preliminary trips should be made across the field. Some students make the first two or three trips perfectly and then go all haywire. Make sure that it is control and not luck that kept the ship straight.

Do not grasp the stick with a strangle hold. Two fingers and a thumb is sufficient for the Rhon Ranger. If one wing tip starts to dip gently pull it up again with the stick, but don't yank the stick hard over. Keep the word "gently" always uppermost in your mind.

If the wing tip goes very far down and almost touches the ground, give a little of the opposite rudder, that is, if the right wing tip drops give left

(*Concluded on page* 51)

New Plane Has Unusual Features

THIS new, all-metal, 2-seater, nacelle type cabin monoplane is known as the R. W. Rambler. It is built on radically different lines, and is so developed that it can be put into quantity production by any automobile plant without changing existing machinery.

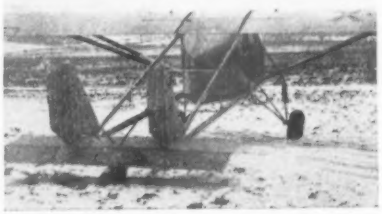
Such production will cut the cost of this plane to probably one-half the price of the average machine constructed of wood, steel, and fabric.

The tail surfaces are mounted on outrigger struts as in a seaplane, the usual fuselage being absent and the cabin resembling an auto-body.

Tests show this plane to be almost fool-proof. It will not go into a tail spin unless forced by the pilot, and will then return to normal flight when the controls are released. Neither will this plane go over on its nose or ground loop when landing on a muddy field.

The wings fold down so that after landing on a field the pilot can readily taxi down the road to his home and park in a garage nine feet wide.

Under tests the plane, primarily designed for private use, commercial travelers, and for training, has reached a speed of 120 mi. per hr. and a height of 10,000 ft. Its length is 24 ft., height 8½, wing area 165 sq. ft. and spread 35 ft.



A rear view of the Rambler ship. The simplicity of its design is said to allow for low-priced quantity production.

The motor is a 4-in-line, inverted, air-cooled engine geared to a ratio of 2 to 1. It was specially designed by Mr. Howard Rhinehart, famous wartime test pilot, one of the earliest pupils of the Wright Brothers. Bernard Whalen, test pilot for the Pratt-Whitney Co., assisted Rhinehart in designing, building and testing this unique plane.

Caterpillar Club Growing

CONTRARY to the general trend of the stock market these days, Caterpillar Club, Common, is still rising, and has suffered no relapse since it was placed on the big board.

In August Caterpillar Club, Common, was quoted at 271. Since that time a gain of 55 points has been made, so that the standing of the Mythical Brotherhood of Caterpillars at the present time is 326 lives saved and 338 jumps made, 12 being repeaters.

XUM

Practical Lessons in Flying

by JOHN B. RATHBUN

Correct Landings

"THERE are many ways of making a landing," remarked Ed, "but in the end, it all amounts to the same thing — landing simultaneously on the two wheels and tail skid—a three-point landing.

"When the ship contacts with the earth in this way, the landing shock is distributed uniformly all over the structure so that each part bears its just burden and without throwing excessive stresses into any one part. If she lands on the wheels, then the tail will drop quickly and will be injured. If the tail strikes first it is easy to imagine what will happen."

The student nodded assent, and then Ed went on: "Another point in making the landing is to land with the wings horizontal so that she will not roll along on one wheel or one wheel and a skid. This may result in a crushed wheel if all the load comes on one side, and a dished wheel will be almost sure to stand her on her nose. Landing with a side wind throws a heavy stress into the wheels and may be the cause of having the landing gear swiped off entirely if the sidewise velocity is high at the moment that contact is made with the earth.

"Cut down the gliding speed as much as possible by landing into the wind, so that the weight of the ship will be sustained at a comparatively low ground speed. It is usually quite difficult to reduce the speed sufficiently for a good smooth contact when landing in a small field, for it is necessary to enter such fields on a rather steep gliding angle and this, of course, means a correspondingly high speed. With a larger field we can flatten out the gliding angle so that the speed is at an absolute minimum. Hey, look at that living example!"

To make a correct landing isn't as difficult as it sounds. A good plane will even land by itself. Here we see capable Ed Heath landing his latest center wing model "hands off."

Bob looked quickly to the south, where Ed was pointing, and witnessed a remarkable moving demonstration of how not to land (Fig. 1). He noted that the ship was sailing along at an unusually fast clip for a ship about to land, and when she made contact, the tail was way up. The net result was a fine series of bounces with a resounding *"boong"* every time the wheels made contact.

The student was literally hammering the life out of her by the high speed, and the strength of the little ship was demonstrated by the way she took her punishment. All in all, there were three "boongs" and three bounces, and then suddenly the instructor took things into his hands and opened up the throttle so that she took-off and began climbing again.

"Now, you saw the cause, the effect and the cure, all at one time," quoth Ed. "Too much speed and too steep a glide was the cause. The result was a series of unholy bounces, and the cure was the application of the throttle and a climb to get out of the mess.

"Always remember this, if you make a poor contact so that she starts bouncing, open up the throttle and gain altitude so that you can try making the landing all over from the start. Get her off the ground and straightened out—and don't let her pound herself to pieces on the ground."

"WELL, here they come again for another try at it," observed the pilot. "Watch 'em this time, and you will see that they will be a whole lot more careful—too careful, probably. No—I'm wrong, they haven't learned a thing, for they are still too fast and still too steep."

Again came the bounce, and again the drumlike "boong." But Ed was wrong in one respect — they quickly opened the throttle after the first bounce (Fig. 2) and the machine started to climb rapidly instead of bouncing along as before. They went up to about 100 feet, made a wide sweeping turn and then started back for another attempt.

"Let's stand here for a few minutes," said Ed; "this is better than a whole college education. I figure that those birds will average about one good landing out of every five landings that they make, and as they haven't made any three-pointers yet, we may see a whole lot of funny business."

He was right. She came down slowly but still at too steep an angle, and thereby just missed a nose over by the skin of her teeth. Quick work with the controls and throttle saved the day, however, and they again picked off and started back for a re-trial.

"Now they will cut out everything,

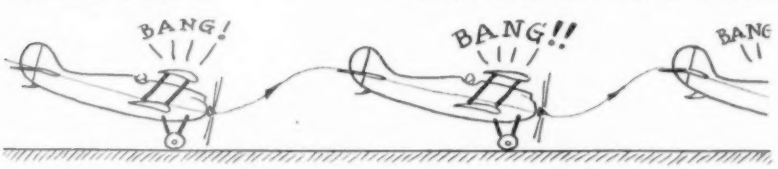


Fig. 1. The combination of high speed and high tail results in a series of bounces.

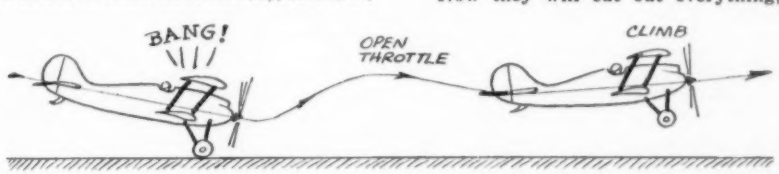
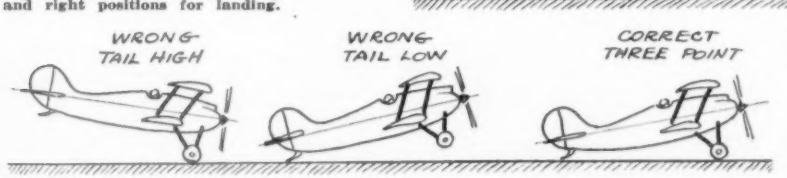


Fig. 2. A series of bounces is averted by climbing for altitude.



Figs. 3, 4 and 5 show the wrong and right positions for landing.

speed, gliding angle and the whole works, and I am putting my money on a good flat smacking pancake," grinned the instructor.

This time the ship was settling rapidly, and with the tail low (Fig. 4). She had no speed to speak of, and then

down she came—tail low. "*W-h-o-o-m*," "*w-h-o-o-m*."

"I'll bet that all of their bridgework and fillings are loose by this time," said Ed. "That's sure the sweetest pancake that ever came off the griddle, and old Mack will have a week's work getting things lined up again. And did you see how they gave the poor old tail the worst of the shooting? It's a wonder that they didn't stick it straight down into the ground."

At this time, the occupants of the ship evidently became discouraged, and started to taxi back to the hangar. They had entirely failed to judge the speed correctly, had not leveled off at the right altitude or had not leveled off at all.

"If I had charge of that outfit, I'd ground them for a month," exclaimed Ed. "They ought to put them back a good week in the work, for I never saw such careless sloppy work—not even around here."

Ed's comment. "Just let that sink in good and deep, and try to do likewise."

"WE'VE had a lot of side views, now let's see whether we can get a look at this stuff from the front."

"Maybe I can persuade Fred Hartwell to make a landing across wind just to show how it should be done and shouldn't be done. He is going to joy ride around a bit, he always does this time in the afternoon, and he might be doing something instructive and entertaining as to burn up a lot of gas for nothing. Wait a minute, I will go over and ask him to put on a before-and-after exhibition for you.

"Say Fred, show the kid how nice it is to land in a cross-wind, and if you wish, don't spare the ship. Any little thing will please us, and if you can roll around on one wheel we'll take up a collection for the widow and orphans just to show that we appreciate your stuff. You know I'm kinda tender hearted, particularly when its your family that's concerned."

"Yeah?" laughed Chief Pilot Hartwell of the Transportation division, "well there ain't going to be any widows and orphans in this deal, and just to be a good scout I'll prove it to you. I'm going to play that I'm a kiwi caught in a Dakota blizzard and that all of the snow is coming in over my left side. Watch me and weep—with envy."

Hartwell took off, sailed around the course at about 100 feet, and then started down for his landing with the nose of the ship slightly into the stiff breeze. He made a rough landing at a rather high speed, bounced up, and turned across the wind.

Then came the thrilling moment for the spectators for up came the wing tip until the wings were standing at about 45 degrees with the ground while the ship crabbed along sidewise at an alarming rate within a few feet of earth.

For an instant it seemed as though he were going nearly as fast sidewise as forward, and that any little mishap would result in having his chassis swiped off. Very gradually, and while only a few feet from the ground, he turned about and headed into the wind at just the instant that the wheels touched the ground so that there was no end stress on the wheels or axle. In hands less expert than those of Hartwell, a crash would have been imminent.

At times a front view saw him heeled up to the right as in Fig. 6, then leveled off as at Fig. 7 and then canted up to the left as in Fig. 8. It was quick work, and required great accuracy, but Hartwell did not take up Ed's challenge when it came to rolling around on one wheel. This would have been a little too much to expect. However, from either Fig. 6 or Fig. 7, it will be seen that a student would be in peril in case that the wheels touched ground.

"WELL, we have seen a number of exhibitions of sorts, so that the next thing will be to follow out the process by steps, that is, to study the successive positions of the ship as it approaches the ground.

"This is shown in Fig. 9 where the landing starts from an elevation of about 200 feet (A) at which point we switch off the engine and nose the machine into a glide, as at (B). The stick is held slightly forward to accomplish this glide. I must caution you, Bob, to avoid carefully any obstacles that might lie in front of you, for the beginner cannot judge the distance which the ship may roll on the ground.

"The engine is not switched off completely, don't misunderstand me, but is so throttled down that it is only turning over from 200 to 300 R.P.M. The speed of the glide, started at (B), is about the normal flying speed or a trifle less and during the glide the ground should be watched carefully.

"If you see that you are going to overshoot or undershoot the point selected for the landing, it is best to open the throttle and make another circuit. It is better to start the glide all over again from the original height than to attempt correcting the end of a mistimed glide by means of the engine throttle until you are more expert.

"When you are about 20 feet above the ground, start to flatten out very

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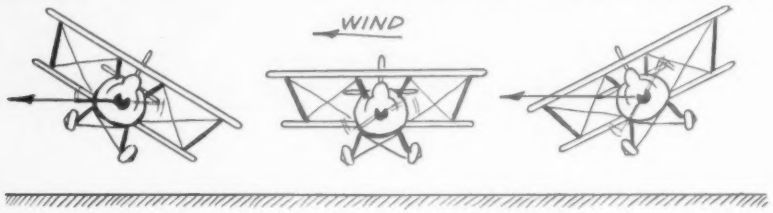


Figs. 6, 7, 8 illustrate Chief Pilot Hartwell's attempt at landing in a stiff cross-wind

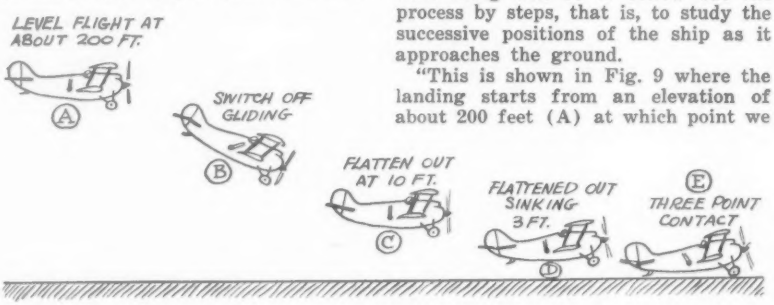


Fig. 9. A diagram showing the progressive positions of the ship as it approaches the ground.

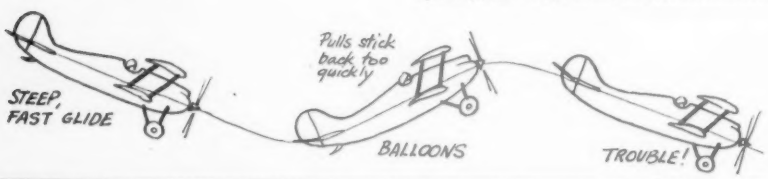


Fig. 10. Another trouble with the average student is the tendency towards pulling back too quickly on the stick when he thinks he is approaching the ground too rapidly.

"Look, look," pointed Ed, "here comes old Vincent—as good a sailor as ever made a landing hereabouts. Watch this baby land and you will have the whole story of landings, four rotten ones and one that is sure to be a knockout. Watch carefully, and you'll see him sit her down evenly on everything that she is to sit on, and she'll roll mighty little—I'm telling you."

Down the ship sailed at what you could easily feel to be the correct speed, and the correct gentle angle (Fig. 5). Gradually she leveled off, with the tail slowly dropping until the two wheels and tail skids all kissed the earth at the same instant so far as Bob could see. "Perfect, and when anything is perfect it can't be any better," was

New Type Glider Soon to Be Placed on Market

A NEW glider, the "Sailing Wing," has been announced and will soon be placed on the market.

The new motorless ship is a 22-foot, midwing monoplane hang-glider, possessing many new features and improvements.

The "Sailing Wing" possesses great soaring qualities, as well as ease of handling. Body movements of the pilot control the craft. This feature is stressed as being extremely useful to the novice, as he gains the "feeling of the air."

The Glider-Wing Aircraft Co. manufacturers of the craft, will offer special club organization plans to prospective buyers. It will be so arranged that a club may operate on as small an investment as $5.00 per member.

Dead Coyote Comes to Life

CLYDE ICE, aerial sportsman of Belle Fourche, South Dakota, with a companion as his gunner, recently went hunting for coyotes in an airplane. Sighting a coyote they shot the animal and, after landing, tossed the apparently lifeless body into the cockpit.

As the plane rose in the air the coyote suddenly revived and attacked the gunner. Ice left his controls and sought to help his companion toss the snarling beast overboard. Both men were wounded and bleeding from the sharp fangs of the coyote, when finally Ice seized a heavy wrench and managed to kill the beast.

Beautiful Seaplane Used as Italian Fighter

THE newest Italian fighting plane is the Savoia S67, a single seater seaplane.

As the photograph shows, this little monoplane follows closely the design of previous Savoia models and yet has some unusual points. Note the semi-cantilever, tapered "gull" wings and the wing floats. The wheels shown here are not a part of the plane's structure.

A 400 h.p. water- cooled Fiat engine driving a pusher prop gives a top speed of 140 m.p.h.; at a cruising speed of 120 m.p.h. Its range is 620 miles.

Heavyweights Require Special 'Chutes

THE "heavies" of the air corps have special parachutes to fit their bulk. Eleven flyers of Kelly Field, Texas, each weighing more than 180 pounds, have received "super-parachutes," which have a diameter of twenty-eight feet, as compared with twenty-four feet for the regulation type.

Among the heavyweights is Lieutenant Lester J. Maitland, who flew with Lieutenant Albert F. Hegenberger in 1927, non-stop from Oakland, California, to Hawaii.

Trick Events Take Place at Mitchell Trophy Race

LIEUT. LOUIS A. VAUPRE was declared winner of the famous Mitchell Trophy Race on November 22 at Selfridge Field, Mt. Clemens, Mich., before an estimated crowd of 20,000 people.

The Mitchell Trophy Race came as a climax to an afternoon's program of formation flights, acrobatics, dog fights, balloon bursting and other fancy exhibitions by the various service squadrons present.

One of the most interesting features of the day was the free-for-all race, which was a mixed event containing a tri-motored Ford, an A-3 (Attack), P-3 (Pursuit), and a PT-3 (Primary Trainer). Of course, the different ships were given handicaps according to their rated speeds, and it was planned in this way to give each of the pilots an even chance to win.

The spectators, not realizing everything about this handicap, seemed to get quite a laugh out of seeing the different types of ships all in the same race. As a matter of fact, it did look most peculiar to see the P-3 come zipping past and then the P-T come sailing by in what seemed like a slow glide in comparison.

Then, too, the big Ford came by with such a roar that a person would think it was moving twice as fast as it really was. This event was won by Lieut. Culbertson in the P-3 by virtue of his clever pylon turns.

There was a speculation among the pilots on the field as to just how long the new P-6's would hold up under the strain of continued high speed required in the race. They seemed to do their stuff pretty well, however, but were unable to overcome the handicap that were given them in most cases.

MODERN HIGH SCHOOL OFFERS COMPLETE COURSE ON AVIATION

A view of the aviation laboratory at the Long Beach High School.

SEVERAL years ago, when high schools and colleges began adding aeronautical curricula to their courses, the city fathers of Long Beach, California decided to add an aeronautical course to the high school's vocational activities.

Long Beach is noted as a city that never goes into matters half-heartedly, nor does it bicker about progress as so many other municipalities do. So the $50,000 the city put into the aviation course was merely the accepted thing for the community of less than 145,000 population. It has been adding to that amount for some time, and today the most complete high school aviation course in the country is available in the Long Beach schools.

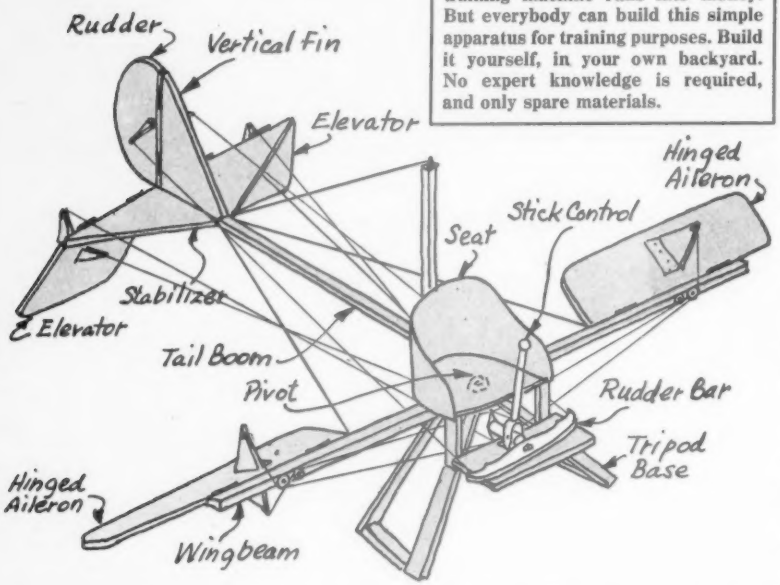
Motor mechanics, rigging and, in fact, everything up to actual flight, for which arrangements can be made by the school with local fields for selected pupils, are taught in the aviation course. The course graduates youngsters with such excellent ground school acquirements that they find immediate employment upon leaving school. And they're good airplane men, too.

The aeronautical journals are studied as part of the course, and nothing of value is overlooked. The school's quarters are modern in every way. They are not hidden away in some basement. The course is regarded as one of the most popular in the vocational division.

How to Build a Backyard Trainer

By J. B. ROBERTS

Not all of us can learn to fly on a real airplane. Even a commercial training machine runs into money. But everybody can build this simple apparatus for training purposes. Build it yourself, in your own backyard. No expert knowledge is required, and only spare materials.



IT SOUNDS like a fairy story, but nevertheless it is true that we can get preliminary training in the use of airplane controls at home and at the expense of a few old boards, some old sheeting and a few nails and screws.

And further, this training can be had without the least danger or risk outside of the danger of hitting our thumbs with the hammer when erecting the trainer. In short, this little device is a captive airplane which is anchored firmly to terra-firma in the backyard, vacant lot, or other open space, where it will be subjected to the variable blasts of free wind.

Many such rigs, factory built and in much more elaborate form, were developed during the war as a preliminary to penguin training, but they fell into disuse because they required a fairly strong breeze for their successful operation. During wartime it is not always desirable to wait several days for a suitable breeze. However, the latter should not be a serious objection for the amateur in view of its other undoubted merits as a flight educator and as a source of much amusement.

As you have probably discovered by this time, it is not always an easy matter to get Dad's endorsement and consent for the construction of a glider or light plane. But when he finds out that the aeronautical problems of his household can be solved at the expenditure of a few dollars and that all flights take place with one foot on the ground, he generally dismisses the subject with a curt "go to it." And that is that.

The captive home flight trainer is simply a wood framework pivoted on a support so that it is free to swing about in the wind in every direction. Attached to the frame are the usual control surfaces such as the ailerons, elevator and rudder, all of which can be moved back and forth by the usual "stick," so as to hold the captive trainer in a horizontal position. The pilot sits on the front beam of the trainer and gains flight experience by moving the controls about to correct for wind fluctuations and irregularities just as he would do on a real ship.

The wind takes the place of the airstream set up by the engine and propeller of the real plane. While the act of balancing the captive trainer sounds easy on paper, it is not so simple in actual practice because of the continual fluctuations taking place in the wind velocity and direction. The wind never comes from exactly the same point twice in succession, and this together with gustiness, makes it necessary to move the stick continually in maintaining equilibrium.

AS SHOWN in the illustration, the frame consists of a wing beam pivoted at its center to a post or tripod frame. Just above the pivoted support is a seat which can be made from an old chair. At either end of the wing beam are the two aileron flaps.

The ailerons are so connected to the control stick by wires or cords that a side movement of the stick moves one aileron up at the same time that the other aileron moves down. This gives us the lateral or sidewise balance, just as the ailerons operate in the wing tips of a plane. A wind gust will strike one end of the beam before the other, tending to upset the rig sidewise, and this upsetting action is corrected by the proper sidewise movement of the stick and ailerons.

Extending to the rear of the seat and fastened securely to the wing beam, is the tail boom that carries the vertical rudder for directional control or steering, the vertical fin and stabilizer and the hinged elevator flaps, the latter pointing the frame up or down, according to whether the stick is moved forward or backward.

This corresponds exactly to the surfaces of a full size airplane and the surfaces act in exactly the same way. While the elevator flaps are connected by wires or cords to the stick, the rudder is connected to the foot-operated rudder bar shown just in front of and below the seat.

By operating the rudder, we can hold the trainer into the wind or at almost any angle with it. When using the trainer it is a very good plan to select some stationary point as a target and to use the rudder for holding the frame in line with this target regardless of what direction the gust of wind may come. This gives us true steering practice, and, as you will discover, the action of the vertical rudder is reflected into the other controls. Thus, if the rudder is turned over sharply it is usually necessary to make a correction with the ailerons at the same time, since one aileron moves at a greater speed than the other, and thus tends to upset the ship.

As it is intended that this trainer be made of odds and ends found lying around the place, the size of which cannot be determined in advance, no dimensions are given. Usually a wing beam ten feet long is ample, while the tail boom should be slightly longer — say twelve feet. Both the wing beam and tail boom can be made out of 2 x 4's or 2 x 6's, but this is not of importance, as any board having sufficient strength and thickness will do.

The control surfaces such as the ailerons, rudder, elevator flaps, fin and stabilizer, can be made up of thin lumber or beaver board, since weight has no importance on this job. To build fabric-covered control surfaces involves too much work unless one is determined to make a very neat and realistic job out of it.

The support can be built up in the form of a three-legged tripod as shown, or it can be simply a post sunk into the ground at one end and pointed at the upper end so that the frame will have as much freedom of movement as possible. A large spike driven into the upper end of the pointed post which fits very loosely into a hole bored in the wing beam will generally give sufficient freedom so that the frame will

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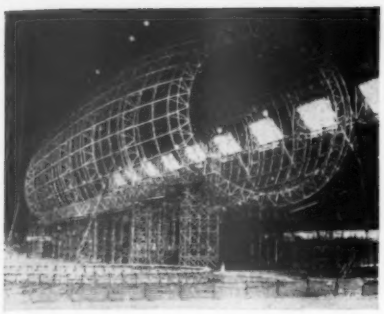


The New Navy Dirigible

THE giant duraluminum framework of the dirigible now being built at Akron, Ohio, for the U. S. Navy, is rapidly nearing completion.

The skeleton now reaches 615 feet. It will be 785 feet long when completed. Every part of the giant craft is undergoing rigid tests before being incorporated in the finished ship.

A List of Rules for Glider Clubs

FOR the benefit of those who are contemplating the formation of a glider club, the following pointers based on the experience of the East End Exchange Gliding Club of Cleveland, Ohio, may be interesting.

1. Don't start with less than twenty members.
2. Get a good backer, like an Exchange Club.
3. Get a good publicity man.
4. Take every available opportunity for concerted club action in money making.
5. Have meetings regularly and insist on payment of dues (25c a week).
6. Purchase a glider from a reputable manufacturer.
7. Don't try to build one unless you have an aeronautical engineer as supervisor.
8. Enter every contest that you can.
9. Build a good trailer. More damage can be done by transporting the glider on a bad trailer than by poor landings.
10. In flying, have a regular flying order and stick to it.
11. Let each flyer have as many flights as it requires to cross the field, i.e., don't give a man one flight, then put another pilot in the seat. Students learn more quickly by having several consecutive flights.
12. By all means, use a training glider before soloing. Suspend the glider on a wire hung between two trees and let each student have an hour or so at the controls before attempting to solo. This saves time, money and effort. If there is not enough wind, have some airplane pilot warm up his motor in front of the trainer, and you can utilize the slipstream for practice.
13. Last, but not least, keep your glider inside the hangar, don't allow it to stand out exposed to the rain.

Army Pilot Gets Ducking

LIEUT. JAMES E. BRIGGS, debonair Operations Officer of the 95th Pursuit Squadron, is in a position to hold his own with any ground flying ace whom he may encounter. It happened thusly.

Lieut. Briggs was towing target for Lieut. J. J. Mulvey about 15 miles out over the Pacific Ocean. Lieut. Mulvey finished his practice, signalled Lieut. Briggs that his firing was completed, and headed for home, where he landed. Ten minutes passed—fifteen—and still no Briggs.

Rumor was rife, so finally three ships took off on a search. Ah! Lieut. Bundy discovered a grease spot on the surface of the broad Pacific with a fishing boat nearby. Flying close to the boat, Lieut. Bundy discovered that Lieut. Briggs was on board, smoking an El Ropo in the absence of a Murad.

The facts were discovered to be: A motor that quit cold—impossible to reach shore—set the ship down to a normal landing on the water—due to the safety belt being unfastened, the pilot was thrown in an ungraceful dive about fifty feet from the ship. Thanks to one fully inflated life preserver, complete with handle, the only injury experienced by the pilot was a good ducking. His ship sank in 105 feet of water but was recovered later in the day by a Navy mine sweeper.

Flight Training in China

THE Military Aviation School, located at Canton, China, accepts out of a large number of applicants, one hundred students each year. The successful candidates, after a rigid physical examination, are given a year's instruction including an intensive course in English and geography in addition to the usual technical subjects.

The school owns about 12 planes. After the student has demonstrated his ability to handle the various types of planes successfully he is commissioned and receives $140 per month.

Alaskan Flyer Makes Hazardous Take-Off

PILOT JOE CROSSIN, pioneer Arctic flyer, took off from an ice floe near Nome, Alaska, a short time ago to save his plane which was drifting out to sea. The ice close to shore broke up suddenly and the piece on which Crosson's plane was resting was blown to sea.

The pilot was rushed to the floe in a coast-guard lifeboat. He warmed up his engine and made a safe, but precarious, take-off from the floating "runway."

Crosson had to fly 90 miles to Clovin Bay to find a safe landing.

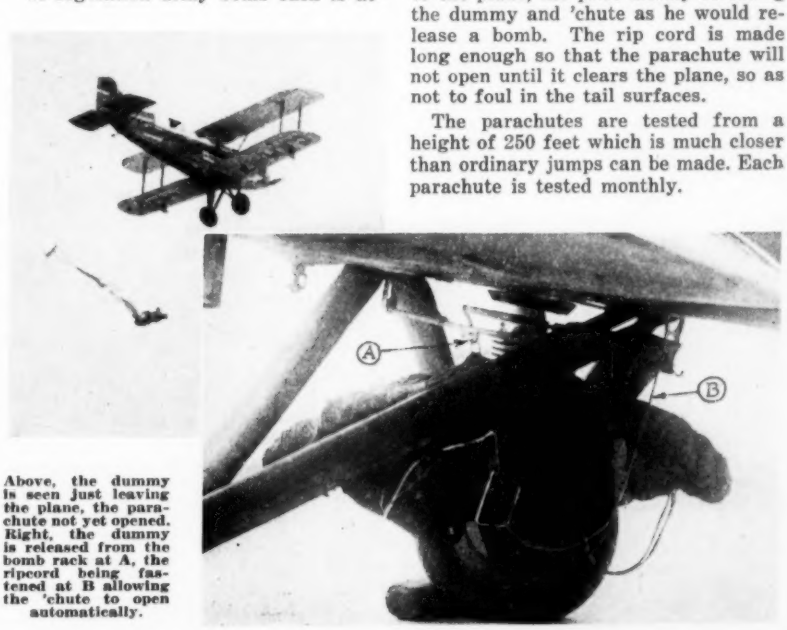
Unique Method of Testing Parachutes

THE National Air Transport Company in safeguarding the lives of their pilots who are forced to jump from a disabled plane with a parachute, have a unique method of testing the 'chutes.

A regulation army bomb rack is attached to the under carriage of a plane. A dummy, shaped to resemble a man, is released by the pilot at any desired height. The dummies weigh 250 pounds which is more than the average man.

The parachute rip cord is attached to the plane, the pilot merely releasing the dummy and 'chute as he would release a bomb. The rip cord is made long enough so that the parachute will not open until it clears the plane, so as not to foul in the tail surfaces.

The parachutes are tested from a height of 250 feet which is much closer than ordinary jumps can be made. Each parachute is tested monthly.



Above, the dummy is seen just leaving the plane, the parachute not yet opened. Right, the dummy is released from the bomb rack at A, the ripcord being fastened at B allowing the 'chute to open automatically.

MODEL DEPARTMENT

How to Build a ROCKET MODEL

By
JOSEPH S. OTT

TO build a rocket ship large enough to carry a live operator is quite costly and entirely out of reason for the average reader to attempt. The best solution to the one who likes to tinker with rocket propulsion is to build a model.

The design of a simple rocket propelled model has occupied much of my attention during the past year. The results of my experiments have been incorporated into a very efficient little plane equipped with a simple rocket mounted under the body forming part of the landing gear assembly.

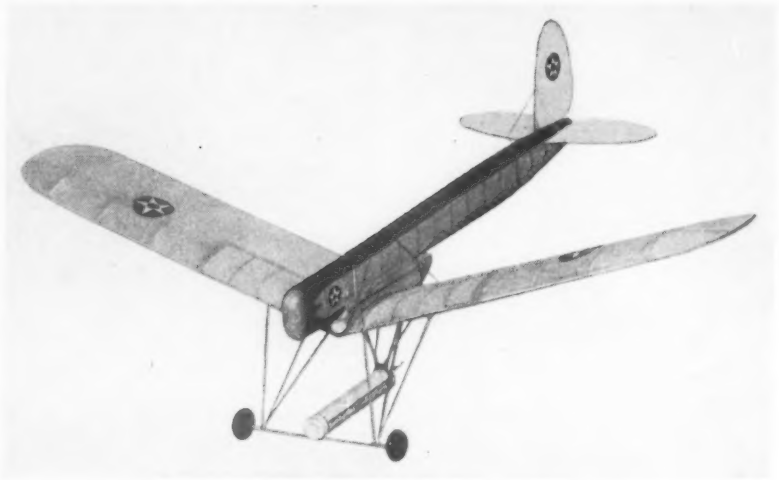
The rocket burns for about twenty seconds, driving the little plane to an altitude from which it slowly descends in a long spectacular glide. The wing spread measures forty-five inches from tip to tip and has a six-inch chord (measured from leading to trailing edges of the wing).

The body, or fuselage, measures twenty-five inches from tip to stern and is formed by light bulkheads placed one and one-half inches apart. Six 1/16" longerons run the length of the fuselage, being cemented in notches cut to receive them in each of the bulkheads. The tail assembly and rear of the fuselage ride high and above the fire stream of the rocket. The whole model with rocket loaded weighs 2¼ oz.

When the rocket is exhausted at the maximum ordinate of flight the weight of the model is reduced 1¾ oz. Due to this lessened weight at its highest altitude the model soars to earth in a series of long glides, answering to the lift of upward air currents almost like a sailplane.

Necessary Materials

No. 1. Plan—1 each.
No. 2. Mino tissue sheets—2 each.
No. 3. A quick dry cement—1 each.
No. 4. 20-second rocket—1 each.
No. 5. Wheels 1¾" diam.—2 each.
No. 6. Bamboo 1/16"x15"—4 each.
No. 7. #032" 1 ft. coil of wire—1 each.
No. 8. Light airplane dope 25%—1 each.
No. 9. Extra light pins to assist in assem. lot—1 each.
No. 10. Rib stock 1/16"x1"x30"—4 each.



What the completed model looks like. It's a beauty!

No. 11. Spars 3/32"x3/16"x30"—6 each.
No. 12. Entering edge 3/16 sq. x 30"—2 each.
No. 13. Tailing edge ⅛x3/16x30"—2 each.
No. 14. Body formers 1/16"x1"x30"—2 each.
No. 15. Longerons 1/16 sq. x 30"—6 each.
No. 16. N. S. war emblem stars—5 each.

General Assembly Instructions

No. 1. Wing.
No. 2. Ribs.
No. 3. Each wing half.
No. 4. Covering joining the halves.
No. 5. Body.
No. 6. Body formers.
No. 7. Longerons.
No. 8. Covering.
No. 9. Tail units.
No. 10. Stabilizer.
No. 11. Rudders.
No. 12. Cover.
No. 13. Body socket.
No. 14. Built up of sections.
No. 15. Streamline.
No. 16. Landing gear.
No. 17. Attach wheels.
No. 18. Rear rocket strut.
No. 19. Brace to end.
No. 20. Skid.
No. 21. Paint—Gear black.

THE color scheme is an important factor in the construction of this particular model. This does not improve the flying quality, but does enhance the appearance of your model. A good combination is to color the fuselage blue or dark green and to have the wing and tail control sections aluminum, which is easily applied in the doping process.

When you appear on the field with a real honest to goodness rocket model you will find the attention of interested people directed toward your plane. It will be examined as to construction and operation and should be dressed in colors fitting for the occasion. War emblems will add to the appearance of your design.

The main wing is the first essential to consider in the building of the rocket plane. Three main spars are prepared from 3/32"x3/16" balsa. Sand these spars to a smooth even finish and examine them to see that they are true to size over their entire length and have no checked or weak spots. On examination of the drawing you will find that two of the spars are cemented along the bottom of the ribs and one spar is mounted on top. This form of spar bracing is very simple to build and has proven to be very rigid in test. It requires no outside bracing in the form of wires or wooden strut members and does not lend itself to dangerous wing flutter which is found in faulty wing framework.

Cut out the ribs to the dimensions shown in the drawing and prepare them with the cut-outs to fit over the spars. As the wing is built with a decided dihedral, it is necessary to assemble the ribs and spars on a smooth surface with two blocks placed under the spar tips to elevate them 5" above the center. Break the spars at the center and reinforce this break with cement. When the spar bends are dry the ribs can be cemented in place.

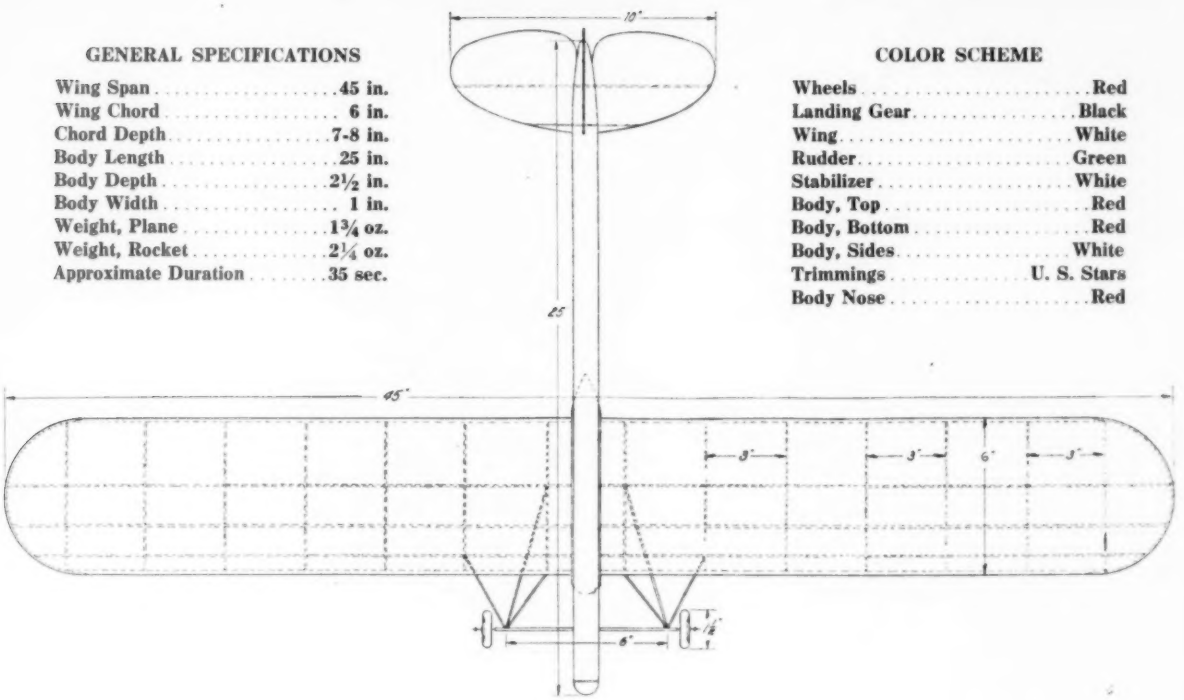
The wing tips are next cut and cemented to the spar tips. Note the manner of attaching the wing tips shown in the drawing. The leading edge of the wing is cut from 3/16" square balsa and cemented into notches cut to receive it on the front of each rib. The leading edge is also broken at the center so that it conforms to the dihedral of the wing. The trailing

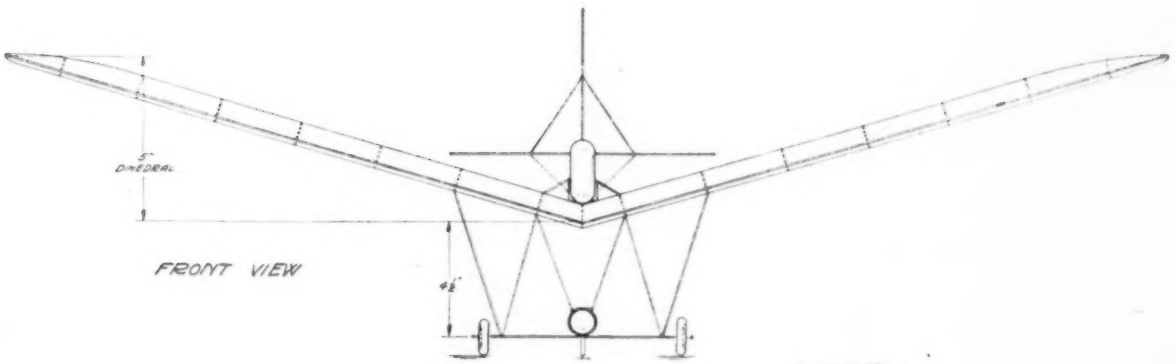
GENERAL SPECIFICATIONS

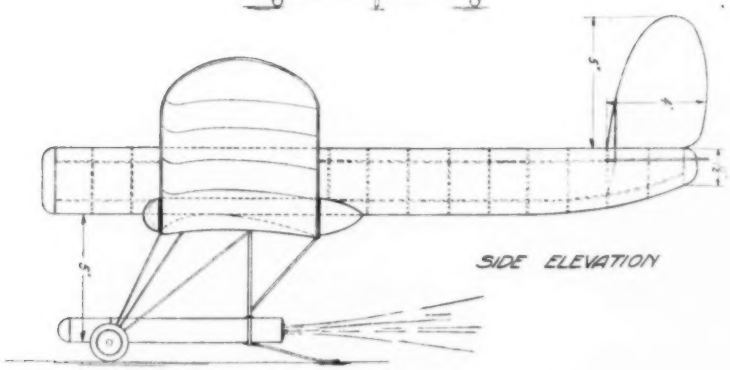
Wing Span	45 in.
Wing Chord	6 in.
Chord Depth	7-8 in.
Body Length	25 in.
Body Depth	2½ in.
Body Width	1 in.
Weight, Plane	1¾ oz.
Weight, Rocket	2¼ oz.
Approximate Duration	35 sec.

COLOR SCHEME

Wheels	Red
Landing Gear	Black
Wing	White
Rudder	Green
Stabilizer	White
Body, Top	Red
Body, Bottom	Red
Body, Sides	White
Trimmings	U. S. Stars
Body Nose	Red



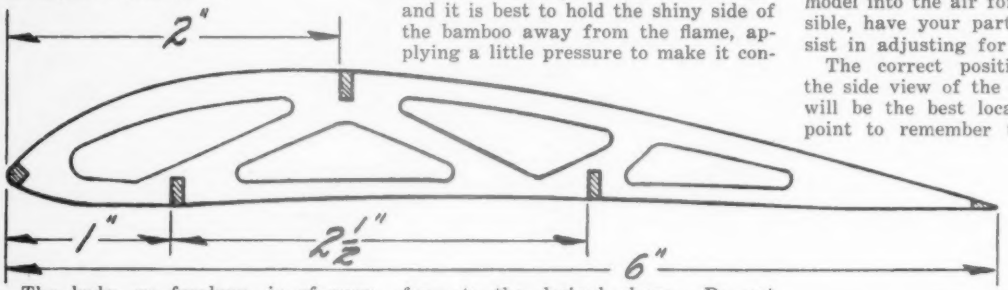




The All-American Model Rocket Plane

edge is prepared from a ⅛"x⅞" strip of balsa which is sandpapered to a knife-like back edge.

Great care should be taken in assembling the wing framework to insure its being cemented and allowed to dry in true symmetrical shape, so that one wing does not have more "lift" than the other. To slap the parts together with no regard for this simple detail will result in the utter lack of ability for flight in your plane.



Full size drawing of rib and body bulkhead.

The body, or fuselage, is of very rigid design. The bulkheads are cut from 1/16"x1"x2½" balsa provided with six little 1/16" square slots to receive the longerons. The longerons are strips of 1/16" square balsa. Proceed to cement the fuselage together, allowing it to dry without warping. The distance between the bulkheads as they are placed along the longerons is 1½".

THE elevator and rudder are made from strips of split bamboo bent to shape and pinned down on a flat surface, where it can be cemented together. When dry the complete sections can be removed and cemented into position on the fuselage. These controlling surfaces of the tail assembly are set in line for level forward flight.

In bending the bamboo any type of flame may be used to heat it before the actual bending takes place. The heat is necessary to loosen the fibers and it is best to hold the shiny side of the bamboo away from the flame, applying a little pressure to make it conform to the desired shape. Do not hold the bamboo directly in the flame, as this will scorch it and cause it to be brittle. After the shape is obtained, the bamboo can be immersed in water, thus causing the sap to recement the fibers.

The assembly of the landing gear is a fairly important one. It must be rigid and all stresses should concentrate at time of landing at the points carrying all the weight. Still the landing shock should not be of such a nature to tend to cause a fracture of the assembled units.

Small spring type axles should be employed—this way absorbing some of the strain put on the wheels and frame.

All the parts for the landing gear are of 1/16" x ⅛" bamboo strips rounded off on all corners. Wherever possible, use thread in holding the ends together—cementing them at the same time. On many occasions while cement is very strong a freak landing might cause a joint to spring apart, but never is this possible when using a thread bound joint.

The tail skid and bumper are made of one piece, the rocket being secured by placing thru the rear strut which is bent like a ¾ circle and closed on the top side with the pressure of a rubber band holding the rocket in position. The front end of the rocket should be streamlined with a small piece of balsa wood.

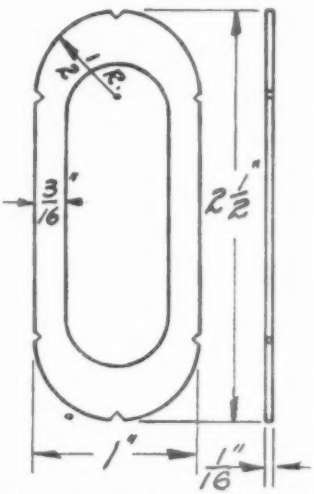
The front end of the rocket should be tied down to the cross member of the axle with either rubber or thread. After the flight a new one may be secured in the same way. The side view will show very clearly just how the skid holds the model in place, ready for the take off.

Covering the model is one of the most careful operations performed. A wing, rudder or elevator improperly covered, may be distorted so much from a true line as to make it difficult to fly the model. The wings and tail section are covered with a good grade of Japanese tissue on one side. Avoid the super-fine tissues sold for use on light indoor models as this will prove too delicate for this model. The body or fuselage is covered with strong mino silk and doped with at least two coats of light model airplane dope.

Flying the Model

THIS model has a very fast flying speed and therefore in gliding care should be taken that good balance is secured before attempting to throw the model into the air for a glide. If possible, have your partner or buddy assist in adjusting for flight.

The correct position is shown on the side view of the drawing and this will be the best location. Here is a point to remember that the body is completely removable and slides in a cradle back and forth longitudinally. This will assist very much in balancing the model rocket plane to a fine degree.



Also the angle of incidence should be about ⅛ of an inch or the trailing edge made lower by inserting a small block curved to fit the fuselage at the rear end of the cradle. Hold the whole of the body in position with a strong rubber band crossed over the body and under the cradle front and rear.

This rocket plane will (R.O.G) rise off ground, which is the ideal method of starting. The skid and wheels hold the plane in a normal position before taking off. Handling a rocket is no more dangerous than a regular sky rocket, but keep in mind that you should stand to one side and not in direct line with the discharge of the pressure flame.

(A limited supply of large sized plans on this model are available upon request. Address your letter to J. S. Ott, c/o POPULAR AVIATION, *608 S. Dearborn St., Chicago, Ill. Be sure to enclose 2c return postage.*

Those writing in, may take the opportunity to express their views, favorable and otherwise, on the various articles appearing in this issue.)

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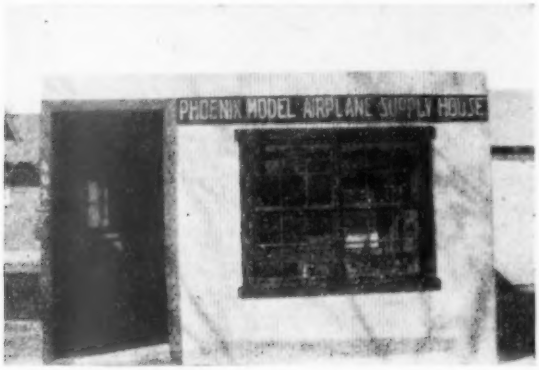
MODEL BUILDERS GO INTO BUSINESS

by M. F. McELRAVY



GUESS I've got enough for one day," a ten-year-old lad said as he took the material he had just bought at the Model Airplane Supply House, Phoenix, Arizona, and tucked it under his arm.

"I made a punk fuselage for a good wing," he complained.

"Finish it up," Harry W. Pryor, the owner of the shop, encouraged, "and I'll display it in the show window."

The lad's expression changed immediately. It meant a lot to have Harry tell a kid that, and away the young customer went to spend the rest of Saturday finishing his airplane.

I waited while six other boys had their particular needs satisfied with miniature wheels, propellers, bombs, metal fittings, glue and lengths of long fibrous Japanese tissue. Then I asked Harry to tell me about his shop.

"My Mother gave it to me for Christmas last year," he said proudly.

"And it's the only one like it in Arizona," a young customer interjected.

Harry continued speaking, "I started to build model airplanes, copies of famous planes, two years ago. Sometimes I'd get an idea that I wanted to work on and I'd have to wait weeks to get my material from the East. Buying it in small quantities cost quite a lot, so I began to buy larger amounts and the other boys who were building planes were glad to buy from me. You see, it made it cheaper for both of us."

HARRY'S boy friend helped him paint the sign "Phoenix Model Airplane Supply House," and he opened for business in the corner of the family garage that had been set apart for his workshop. Business was good and in a few weeks his stock was exhausted. He reordered and the same thing happened again and again.

"I haven't much time to give to my shop," Harry said, "and it's a big responsibility, but I've made enough to pay for my own supplies and so I'm contented."

Picking up a piece of wood that looked to me as if it were heavy, he explained: "This is called balsa. It's the lightest wood of commercial value. I buy it in pieces this way and the manual training teachers cut it up for the boys."

The Phoenix Model Airplane Supply House is ten feet by eighteen feet. It is constructed of corrugated iron, has a flat roof, a window on each side and a door and show window on the front. The interior is taken up with shelves, a counter and storage space in the rear.

Harry Pryor is a sophomore in the Phoenix Union High School, where he is taking a scientific course. He opens his supply house after school each afternoon and keeps it open all day Saturday.

Besides selling his young neighbors the things they need for creating model planes, he gives an inestimable service in that he encourages beginners and patiently helps them figure out problems of construction. With them he discusses endurance of materials—speed to be obtained—and magazine articles as they appear monthly in various magazines. He also builds model planes for sale when he has the time.

"Do you enter any of your models in contests?" I asked.

"His Curtiss JN4D-2 took first prize in the High School Contest," an admiring young customer volunteered.

"And he got second, third and fourth prizes, too. Only they gave just one prize to each boy."

This year the Phoenix High School will have another contest open to all the schools and no doubt Harry will have to make his model between times, because so many boys are buying materials for the models they are going to submit.

PHOENIX boys who are not old enough to play at building model planes would rather own one built by Harry Pryor than the most expensive plane in a toy shop, because they know his planes fly. If they are wrecked Harry will figure out some way to mend them.

When the small customers were ready to leave he offered to fly his tailless model for me. His customers followed us out in front. In a moment five more neighborhood boys joined us.

A tiny girl's voice pleaded from across the street, "Brother, come play with me.

A curly-haired lad called back, "You just wait—Harry's going to fly his tailless ship."

Young Pryor adjusted a tailless plane of his own design and spun the propeller. Again he adjusted the slender wires and spun the propeller. Then he poised the fragile creation of balsawood, wire and Japanese paper. The lads and I waited eagerly. The plane took off. Over the shop roof it went and flew higher and farther away.

There was not a sound as it dipped, then made a new altitude. I looked into the boys' faces and they looked into mine as much as to say, "We knew it would fly."

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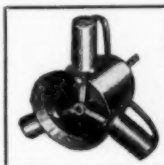

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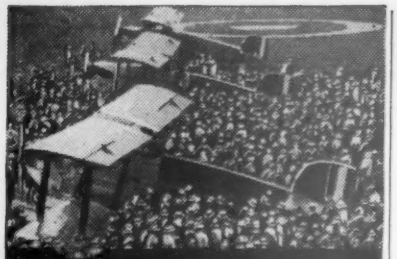

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WOMEN'S ACTIVITIES

EDITED BY **LOUISE THADEN**

SO many inquiries have been coming in asking about the 99's that I shall have to break down and give you a short explanation.

The 99's were organized over a year ago in New York City when a representative group of women pilots got together for the purpose of forming the women pilots of this country into an organization for their mutual benefit. It was decided to send out a form letter explaining the purpose of such an organization, and to name the group from the number of pilots who came in as charter members—hence the "99's."

Louise Thaden

Any woman who holds a government license is eligible to join, and is automatically severed from the group if she loses her license.

The club is rather unique in that it has no president nor vice-president, all business being handled through the seven district governors, and through the national offices of the secretary and treasurer, of which I am the former and Blanche Noyes of Cleveland the latter. The 99's now have over 275 members.

* * *

Miss Winifred Spooner, who recently took a bath in the sea off Naples, Italy, made an attempt at an altitude record before leaving England, but failing to get over 21,000 ft. did not apply for an official calibration of her barograph.

* * *

Mrs. Blanche Noyes of Cleveland will be present at the races in Miami, as will also Mrs. Kieth Miller. Both expect to remain in Florida for several months. We envy them.

* * *

I recently wrote Edith Foltz of Portland, Oregon—a participant in the 1929 Women's Derby, and one of the "also rans" in the west coast men's derby this year—for her "life story." She came back with the following: "You asked for my life story—I am afraid I haven't anything of importance to send. My life's ambition was to be a grand opera singer and I turned out to be a flyer,—figure it out for yourself."

Edith is quite the girl in aviation in the Pacific Northwest, and you have missed something because of her modesty.

* * *

Lady Drummond Hay has one of the new D. H. Puss Moths fitted up with an "office," typewriter and everything, so that she can write her articles en-route.

Mrs. Victor Bruce, now in this country on a flight around the world, is certainly making a nice go of it. We are sorry she has had a few difficulties over here, and wish her much luck the short distance she has yet to go to complete the voyage. Mrs. Bruce is an Englishwoman, starting on her flight from London.

* * *

Miss Amelia Earhart is no longer associated with T. A. T. She has resigned from the post of assistant to the traffic manager to devote her entire time to the vice-presidency in charge of public relations for the Ludington Line, plying between New York City and Washington.

* * *

I ran across Mary Alexander of Lynchburg, Va., in Washington the other day. She tells me she is starting a school and already has ten students at work. Her young son has soloed, and can fly rings around her—so she says. At any rate, the Alexanders are a flying family.

* * *

I also saw Ruth Webb in Philadelphia. Ruth is hard at work for Ludington Flying Service at the Camden Airport, and flies around in a fleet on week-ends to keep her hand in. Ruth has just purchased a baby Austin car, and has completely filled it up with a police dog. It's even a small kennel, Ruth!

* * *

The eastern sections of the 99's plan on a meeting in New York City shortly. This will be the first meeting since the national one held in Chicago during the races.

* * *

Things aeronautical in California have slowed down somewhat. Bobbie Trout, one of the old timers among women pilots out there, is back to running her filling station. Bobbie lives in Los Angeles, and knowing her as I do, she will get itching hands soon, and be flying again whether she eats or not.

* * *

I recently had the pleasure of flying over New York City after dark—rather a wonderful sight—wonder how much money is paid for electricity around that town?

* * *

A storm of protest has fallen around my unsuspecting head regarding a statement that was made several issues back about flying conditions in Canada. To the many who have disputed my statements, I sincerely apologize if I have unwittingly cast reflection on their country.

My information came from pilots of the Royal Canadian Air Force, who report that in the interior of Canada there are practically no places to land

except on the numerous lakes and rivers.

I am quite well aware that in the provinces bordering the States, the majority of operations are on wheels. However, in the interior (which forms three-fourths of territorial Canada), I still believe that floats and skiis outnumber wheels.

What I Learned About Gliding

(*Concluded from page* 40)

rudder, and if the left wing tip drops give a little right rudder.

When the aileron and rudder control has been mastered, and not until then, the air speed may be increased up to 15 to 20 m.p.h. Try at least one trip across the field at this speed without attempting to take off. When this has been done, start off again and when the ship is going level and straight behind the car gently ease back on the stick.

Again use a little caution; "gently" is hardly a gentle enough word. The Rhon Ranger is extremely sensitive on the elevator control.

However, ease back on the stick until the bumps seem to flatten out and the ship is just skimming across the surface of the ground in a series of long flat hops. If the ship starts to climb, don't immediately shove the stick forward. Take time to think, and then gently ease off forward just a fraction of an inch. In fact, if the rope is cut loose the Rhon Ranger will land itself perfectly from 5 to 6 feet without putting the stick forward at all.

When the first low hop has been made successfully, do not become overconfident. Be satisfied with 10 or 12 feet of height for quite a number of trips before grabbing off altitude. Always remember, no matter how fast the ship starts to climb on the first trip, take time to think about "gently" before easing the stick forward.

To the unitiated all this may sound like the height of caution, but it is my experience that the novelty of replacing cracked skids and repairing wing tips soon wears off.

When the glider is operated by a club it is recommended that each member make at least three trips in succession at the start, as in this way he will learn quicker than just making one trip, and then waiting for his turn to come round again.

MODELS THAT NEVER FLY

(*Concluded from page* 26)

powered with an eight-hundred horsepower motor.

To run a test, the model plane is mounted upside down on the end of a lever which projects down into the tunnel from the recording scales which are on a desk in the control room overhead. The fan is started and, from the control room, the wind is created at the desired speed. When this breeze passes over the model, it becomes the "relative wind," and the forces exerted on the stationary model are exactly equal to those which would be exerted if the plane were moving through still air at the desired speed.

Since the plane is attached to the control lever, all forces exerted on the plane are recorded on the scales, and the operator in charge of the test notes the figures.

If the wind tunnel tests are satisfactory, and the Bureau of Aeronautics is interested in using the plane in the service, actual flight tests are made at the Navy's test station in Anacostia, D. C., but the wind tunnel tests assure its airworthiness before it is ever flown.

The greatest monetary saving is effected when the wind-tunnel tests prove a type unsatisfactory, and it is abandoned without wasting money on construction. And, usually, scores of types are tested before one is accepted for service in the Navy.

Life, as well as money, may be considered saved by the wind tunnel, for many plane-types that looked good "on paper" have been found deplorably unstable in tunnel tests. Which means that if they had been built, and an attempt made to fly them, the test-pilot's chances would have been small indeed.

The great importance of detail shows up more in wind-tunnel tests than in any other way. For instance, it was discovered that simply rounding off the front of seaplane pontoons reduced their drag thirty per cent! The power saved and speed gained by that one change seems enough to justify all the research ever made in any tunnel.

Then, quite recently, a new monoplane model was in the tunnel, and the engineer in charge of the test saw that there was considerable turbulence in the air flow over the wings. After experimenting, he raised the three motors one-fourth of an inch on the model—which would mean about six inches on the full-scale plane—and the air flowed smoothly. Another model "suffering" from air disturbance was made normal when plasticine clay was put along the fuselage to improve the streamline.

So much for small things; as for wind tunnel effects on large ones, consider this:

All new-type airships as well as airplanes are tested by model-runs in the wind tunnel, and the two airships now under construction for the Navy, the largest aircraft ever built anywhere, were given wind-tunnel tests here before the design was approved.

These two ships were first planned shortly after the "Shenandoah" broke in two several years ago, and a necessity for a change in design was clearly indicated. Tunnel experiments were made, and showed that if an airship were built with a larger diameter in proportion to its length it would not only be much stronger, but it would also have less wind resistance and produce more speed from the same power.

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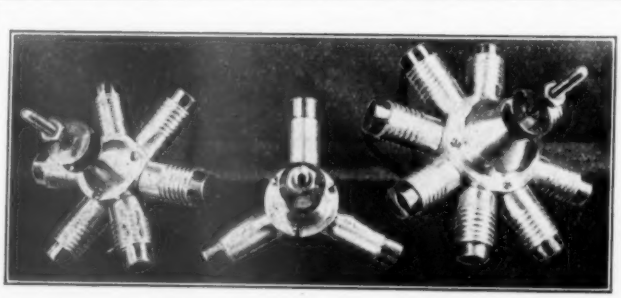

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How I Got Into Aviation (*Concluded from page 34*)

certainly was thrilled to get a ride with him. He also had Mr. Harry Guggenheim with him.

It was raining a little bit, but not too much to make the hop. We pushed out the ship and warmed up the motor and took off. This was my first ride in the rain. There seemed to be no difference except that you cannot see as much as on a clear day.

In September, 1928, I flew with Charles B. D. Collyer, who was the pilot who flew around the world in twenty-three days with John H. Mears. We went up in the ship he used on the trip. It was a Fairchild powered with a Wasp motor.

In March, 1929, I flew to Washington with Martin Jensen, the pilot who placed second in the Trans-Pacific trip to Hawaii. We used the same ship, the Aloha. He was going down to bring back pictures of President Hoover's inauguration.

I did not know I was going until about half an hour before leaving, and it was some rush to get home, break the news, grab a toothbrush and get back, always fearing that he would leave before I got there. I had the fare to come back on the train, but the idea didn't appeal to me, so after spending a couple of nights at my grandmother's and haunting Hoover Field for a familiar face, I finally found John Wagner from Curtiss Field and bummed a ride back with him in a Fairchild, and telegraphed Mother, who was at the Field to see me land.

On January 8, 1930, I got a chance to try a glider which was owned by Roosevelt Flying School. This was my first time in the air alone. They shot the glider off a little hill with shock-cord, but I don't suppose I was over forty feet high. Gliders are all right, but I prefer the feeling of some power. In this month I also had my first trip with a parachute, when I went for a hop with George Weis.

On 4th of July night, 1930, we had a night aerial show at Roosevelt Field, with many interesting exhibitions. One of the most interesting to me, because I took part in it, was the bombing of a fort.

They built a small fort on the field, with fireworks behind it and a few men to set them off. Then we attacked in a plane, Randy Enslow piloting. I was the gunner, firing a Very pistol each time we came over the fort. Randy dove right at the fort and we made some good hits, perhaps uncomfortably close for the fellows in the fort.

We kept this up for half an hour and it was great sport. We used a Fairchild KR-34. The event took place about eleven o'clock, and the field was bright as day with the powerful flood lights and the spot lights on the fort. When we circled around we could see the lights of New York and thousands of other lights in all directions.

I wanted to start to take my flying lessons as soon as school was over last Summer. I told Mother and Father so, but they said if I insisted on learning to fly I would have to pay for it, probably thinking that would put a crimp in my ambition to engage in a work which they still considered hazardous.

However, that did not stop me. It simply meant getting a job. I landed one at the Operations Office at Roosevelt checking planes and pilots arriving from cross-country flights. I liked the job because I met all the pilots and knew almost everything that was going on at the Field. I worked at this after school, and by the time school was over for the Summer I had enough saved to start my lessons.

I continued to work and took my lessons about seven o'clock in the evening. My instructor was Lester "Husky" Flewellyn. After three and a half hours of instructions he soloed me.

MY FIRST solo meant no more to me than the dual hops with Husky, except that the front cockpit seemed very empty and large. In addition, the ship naturally got off quicker and climbed faster and landed slower with Husky's 190 pounds out of it. Then it was just a case of putting in the necessary solo flying time, required for a license, and practicing figure eights, spins, forced landings, spirals, and landings and take-offs.

I didn't build up my time very fast because my saving had been nearly wiped out. I had to string my hours out until I earned the necessary funds. I took me nearly two weeks to earn enough to fly one hour. However, by the middle of August I took and passed my test and received a Private Pilot's License. I also got a F.A.I. Certificate and Sporting License.

The Roosevelt Flying School is the dealer for the Aeronca, a small two-cylinder thirty horsepower monoplane. This ship weighs only three hundred eighty pounds. The school wanted me to do something to get some publicity for this little plane so I suggested making an altitude flight with it.

After a few delays we received a sealed barograph from Washington. On October 26, about 3:30 P.M., I took off and climbed for an hour and a half. My altimeter showed 11,800 feet.

I kept trying for fifteen minutes but could not get it up an inch higher, probably because it was a cold day (at that height the temperature was 9 above) and I had no carburetor heater. Then the motor lost power, and, realizing that it would soon be dark, I came down, landing about five-thirty, just as it was getting dark. The barograph was sent to Washington to be checked and we were later notified that it checked out to 10,525 feet. *An official American record for planes weighing less than four hundred forty pounds!*

This was better than I had figured on. I thought I had set only a *Junior* record.

My next higher licenses, the Limited Commercial and Transport Pilot, cannot be obtained until I am eighteen years old. In the meantime I am just building up my flying time towards two hundred solo hours required for a Transport License.

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TRI-STATE COLLEGE

A New System to Facilitate Handling Airships

(*Concluded from page* 36)

able transmitter, and the spoken message projected to the ship by the mast loud speakers.

During the operations of moving the ship about the field, the mobile mooring mast, of course, accompanies the ship constantly. The officers can pass messages involved in these operations by means of their own portable transmitters and the loud speakers installed on the mast, so that the entire crew cannot fail to hear all the orders.

To Power or Not to Power

(*Concluded from page* 16)

something with plenty of horse-power has thrills of its own.

The part to flying an airplane which requires some readjustment on the part of the glider pilot is coming in for a landing.

In the Eaglet we dove for the field at 70 to 80 miles an hour. The process of losing flying speed and getting down to landing speed was gradual when compared to a similar performance in the glider.

As we neared the ground, Holihan eased the stick back slowly, until, when we landed, it was as far as it would go. But for the glider pilot who has made a large number of towed flights, learning to fly a light powered ship would be a comparatively simple matter.

Subscribe to POPULAR AVIATION

PRACTICAL LESSONS IN FLYING

(*Concluded from page* 42)

slowly by pulling the stick toward you by almost imperceptible degrees (C). At about 10 feet off the ground, the ship should be about level. Still pulling back on the stick very slowly and gently, lower the tail still more and further decrease the speed by increasing the attack angle and drag of the wings.

"This latter condition is seen at (D) where the tail is dropping. At (E), the wheels and skid are about on the ground line and within a foot or so of the ground so that a little further settling will give us a three-point landing.

"Now, as you have probably observed on the field, the average student starts to flatten out too early, say from 15 to 20 feet above the ground. This will always result in a pancake, which in a way is equivalent to a stall. If flattened out at too high an elevation, the machine loses its flying speed and lift at this elevation and thereupon drops to earth. When finally landed, the tail should be allowed to drop on the ground of its own accord.

"If the machine is flattened out too late, any one of a number of things will happen, ranging from washing out the landing gear to a series of good healthy bounces. The most important thing to watch is the point of flattening out and the rate at which the stick is pulled back. This comes mostly with practice, and no one is very likely to do it the first, second or third time without trouble.

"Another trouble with the average student is the tendency towards pulling back too quickly on the stick when he thinks that he is approaching the ground too rapidly. The result is, that the ship climbs suddenly or "balloons" as indicated in Fig. 10. This ballooning soon kills the speed so that the descent on the other side of the peak is more rapid than ever and may lead to a stall or pancake if the throttle is not opened quickly. Here, as in many other maneuvers, the use of the engine to gain flying speed is of great assistance.

"Well, this has been a lot of ground instruction but the next time we will apply the principles to practice. The first thing to do is to dope out what is to be done in advance—and then do it. You have had quite a little experience so far, and as soon as you learn to take-off and land with fairly decent accuracy, we will take a few cross-country flights just to get the hang of flying under practical conditions and then start in with aerobatics."

Bob had pondered over what he had seen and heard on this day, and while he had had no actual flight practice he understood that there are times when a considerable amount of explanation is better than a lot of practice.

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An Airy Chat With the Editor

(*Continued from page 8*)

the relative responsibility of each, and further study is being made on that point. The current belief is that the propeller is the worse offender of the two.

Try this experiment: Run your electric fan without the fan. The motor makes little noise. Put the fan back on, and the faster the tips revolve the greater the uproar.

* * *

BOB RINGLE would like POPULAR AVIATION to change its style of covers. Bob prefers that we run a series of popular current models in colors suitable for framing. Anybody else care for this idea?

You see, Bob, we don't shove your suggestion into the waste basket. We give you a fair break, your opinion against ours. If enough other readers side with you, so be it, and the change will be made.

By strange coincidence, S. S. Wilson, one of our Canadian readers, wrote us the same day as Bob Ringle. Wilson's letter was sent to *compliment* us on the recent covers we have been running.

* * *

J. H. PRATT of Edenberg, Pennsylvania, has some rare comments to make on our December issue. "I'm with you heart and soul," writes Pratt. "Isn't Herr Martens 420 in December issue a peach? Also Clyde Cessna's one-place job the berries? When they get ships and training down to a reasonable figure, I'll have one trade every year. Just as I do on my Lizzie. Don't go out of business. Life would be dull without POPULAR AVIATION.

"Why don't I ever hear any radio programs put on by aviation interests? Don't they need any one to sell their products, or are they too poor to hire a jazz band? Millions don't know we have an Air Transport Line from coast to coast or that airplanes are for sale to the public."

Glad you like us, J. H. Don't worry about our going out of business. We're here to stay—and as long as you and your friends retain your enthusiasm for POPULAR AVIATION we guarantee that it will be grander and better than ever this coming year.

There have been several small local aviation programs on the air, none very important. The suggestion is a good one, and some of our more extensive airlines ought to take you up on it.

* * *

HARVEY GEERY of Modesto, California, is working on a propeller design which, though not exactly new, is interesting.

Geery writes, "I am working out a design of an adjustable airplane propeller by which a pilot from the cockpit can adjust to a position that will greatly retard the plane's momentum while making a landing. A plane can be driven backward as well as forward and can be adjusted to a position that the plane will not move while the propeller is travelling at its highest revolutionary speed.

"It is very simple in its make-up, easy to operate, not very expensive to make, adds no extra weight to the plane, and can be installed on planes now in use. I would like your opinion if such a type of propeller would be of any practical advantage to aviation."

There are several adjustable and reversible pitch propellers already on the market. This type of propeller, though recognized as having some merit, has not yet been widely adopted.

* * *

ONCE in a while we receive a letter from a reader who criticizes POPULAR AVIATION from cover to cover. Such a one came from Marvin Hershberger of Bennetts Switch, Indiana.

"Models, gliders and light planes, you say, is what your magazine stands for. Well, here's hoping you will keep it there. I have enjoyed the past six or seven issues very much.

"'Is the Jumping Balloon Doomed?' and articles of similar nature are of

(*Continued on opposite page*)

HERE THEY ARE!

A Complete list of gliders on the American market. Read about them in POPULAR AVIATION

Make	*Price*
Glide-Air	$ 175
Primary Aeroglider	225
Cessna C. G. 2	248
Woerner Intermediate Glider	300
Alexander Trainer	375
Waco Glider	385
Mead Rhon Ranger	395
Aerobat	395
McGill A-1	395
Mattley Primary Trainer	435
Detroit Gull	485
Blondin Gull	500
Cook Primary Trainer	500
B. M. Cadet	525
Mattley Secondary Trainer	535
Leonard 2-Place Glider	550
Bowlus Trainer	550
Heath Super Soarer	575
Peel Glider Boat Z-1	595
Crawford's Powered Glider No. 2	600
Dragonfly	650
B. M. Trainer	650
McGill B-1	795
Bowlus Albatross Sailplane	975
Crawford's Powered Glider No. 1	975
Woerner Sailplane	1200
Wichita Soaring Plane F-1	1250
B. M. Condor Soarer	1500
The Buzzard	1600
All American	——
Northrop Glider	——
Evans All-Steel Glider	——
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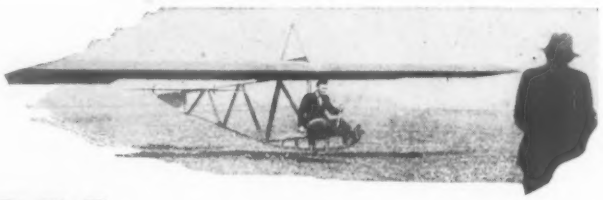

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vital importance to every one who wants to get off the earth. And your many pictures and short articles are interesting. Your construction articles of gliders and light planes are well worth while. I hope you will tell us how to build a powered glider next.

"I enjoy your model department by Mr. Ott very much. I have been constructing scale models in a backwoods sort of way for the past ten or twelve years. He does not keep his models so near scale, but the flying qualities far overshadow this, and I hope he will design us some models of the war machines you are going to publish. There are other magazines telling about flying sticks, etc., so let's have more scale flying models.

"It seems, though, that all the space devoted to that 'Doakes' foolishness could have been better used. Then I noticed a few lines by this Thaden woman, that some are wanting a question and answer department for women. She might have just as well said a fashion department, for that's what it would be, and a glider and model magazine would look nice having them spread themselves over a couple of pages, now wouldn't it?

"No doubt, it's a hard job trying to please every one. And I've seen a lot of fellows swamp the whole thing by trying to do it. Models, gliders and light planes or a magazine like yours is one I have been waiting for ten years, and I hope my two fifty is worth as much as anyone else's. There are a lot of magazines devoted to all the rest.

"I suppose I will get a little note appreciating my advice. Well, thanks, Ed., but just keep the stamps and tell us more about MODELS, GLIDERS and LIGHTPLANES.

"P. S. I wanted to mention about your 'Airy Chat.' Keep it up, you are giving us some valuable dope. And by the way, in leafing through the back numbers of POPULAR AVIATION, I noticed in the September, 1930, issue a short article about Ray Wilcoxsen somewhere in Indiana and his lightplane. I wonder if I might have his address or let him know that I am interested in his ship?"

Them's harsh words, Marvin, particularly about women. You and Capt. Purcell ought to get together. Ray Wilcoxsen's address is 2229 Reidmiller Ave., Fort Wayne, Indiana.

Don't worry, we're not going to devote several pages to a question and answer department on women's styles. But we have been thinking of another type of question and answer department. Let us say J. S. Ott conducted one on models; John B. Rathbun one on general aviation in theory and practice.

What do you think?

LAST month we received some rare news that we are passing on to you exclusively. It came from Paul Knopf, Chief Pilot and Engineer at Klagenfurt, Austria.

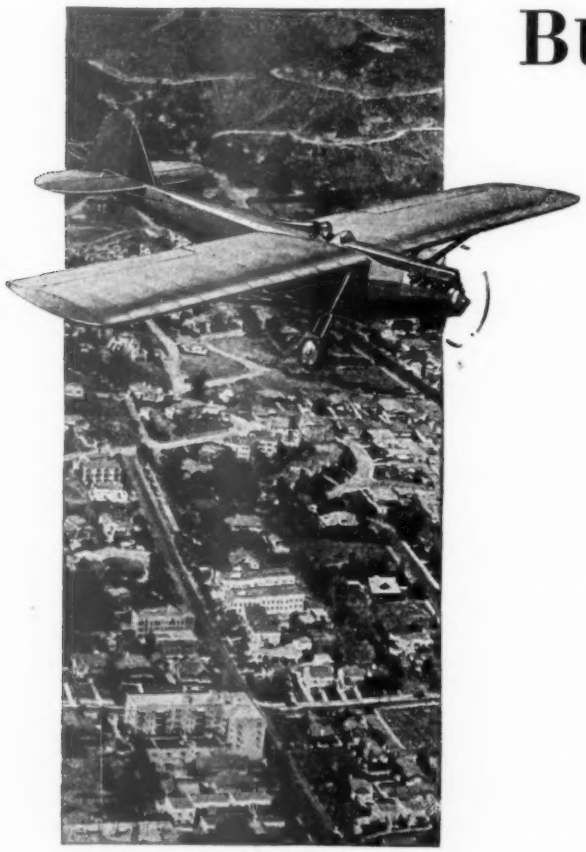
Mr. Knopf is planning to come to the United States early this year. He intends to buy a Lockheed over here and attempt a trans-Atlantic nonstop flight from the U. S. to Germany. Luck to you, Mr. Knopf. When you're over here, drop in and pay us a visit.

* * *

THE following letter was sent to us by R. F. Belke of Kiel, Wisconsin: "I have just finished reading your marvelous account of the death of Quentin Roosevelt and thought you might possibly be interested in the fact that I have a picture of the dead body of Lt. Quentin Roosevelt lying beside his wrecked Nieuport type 28 (ensign on fuselage is kicking mule with numeral 14). This photo was given to me by a former A. E. F. man who procured it from a German Observer who saw the tragedy and later took the photo I have."

Many thanks to you, R. F., for the offer. We have seen this same picture before. One day last summer the writer of this column made the acquaintance of an air traveler while flying over Oklahoma. The stranger told us about the picture which was in his possession.

(*Concluded on page* 60)



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How to Build the Heath Parasol

(*Continued from page 39*)

Attach the plywood (V–96) by drilling with a #60 drill, three small holes in the horn and nail the plywood as shown in detail #1. Round all edges with a file and sandpaper. Bend the lugs at a right angle. The horns are made right and left. Attach to the spar with items V–88, V–92. The long arm of the horn belongs on top.

Gas Tank

IN THE sheet of tern plate (V-145) outline a piece 21⅝"x29¼", and two pieces 6½"x9¾" each. Cut out these pieces. On the larger piece draw a line paralleling the side which measures 21⅝" and 9⅛" from it.

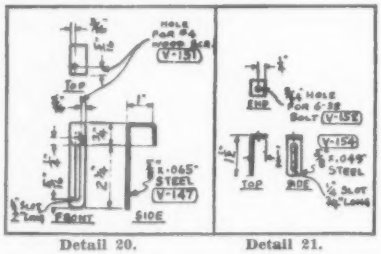
Draw a second line 5" from the first and a third 9" from the second. A fourth line is drawn 5¾" from the third and ⅜" from the end. Bend the sheet carefully on each of these lines. Be sure that they are straight and parallel to each other. Use a heavy straight edged bar of iron or hard wood to assist you in making these bends. Solder the meeting edges together.

Take one of the smaller pieces and mark out an end for the tank allowing ⅜" on each edge to be turned in for soldering. If the tank ends are made so that they fit inside of the tank, a little pressure of the hand will keep the edges in contact while soldering. Be sure that the surfaces to be soldered are clean and bright and use only soldering paste, not acid, as a flux.

From item V–147 make the lugs which hook over the front spar (Detail #20 wing print) and from item V–154 make the side lugs (detail #21 wing print). A slot cut into that side of the lug which is to be soldered to the tank, facilitates soldering. On the side of the tank which belongs next to the spar, solder the lugs shown in detail #20 and on the opposite side, solder the lugs shown in detail #21.

See detail #8 (wing print) for location measurements. Locate on the drawing of the tank and mark on the tank the centers of the drain plug (V–156), filler neck (V–146) and feed sump (V–155). If you intend to build a sky light into the wings, mark also a place on the side of the tank for a gasoline gauge (V–175).

Drill a ⅜" hole for the drain plug on the bottom of the tank and solder the flange over it. Now test your tank by pumping air into it through the drain plug hole while the tank is submerged in water. Resolder wherever bubbles appear.



Detail 20. Detail 21.

Cut a hole ¾"x3½" for the feed sump and solder the sump over the hole. The opening in the sump should face the front. Cut a hole in the top of the tank 1½" in diameter for the filler neck and one in the rear side 1½" in diameter if you are going to install a gasoline gauge.

These larger holes may be made by drilling a series of small holes along an outline and then removing the rough edges with a file. Saw the skirt from the filler neck and solder the threaded flange to the tank top.

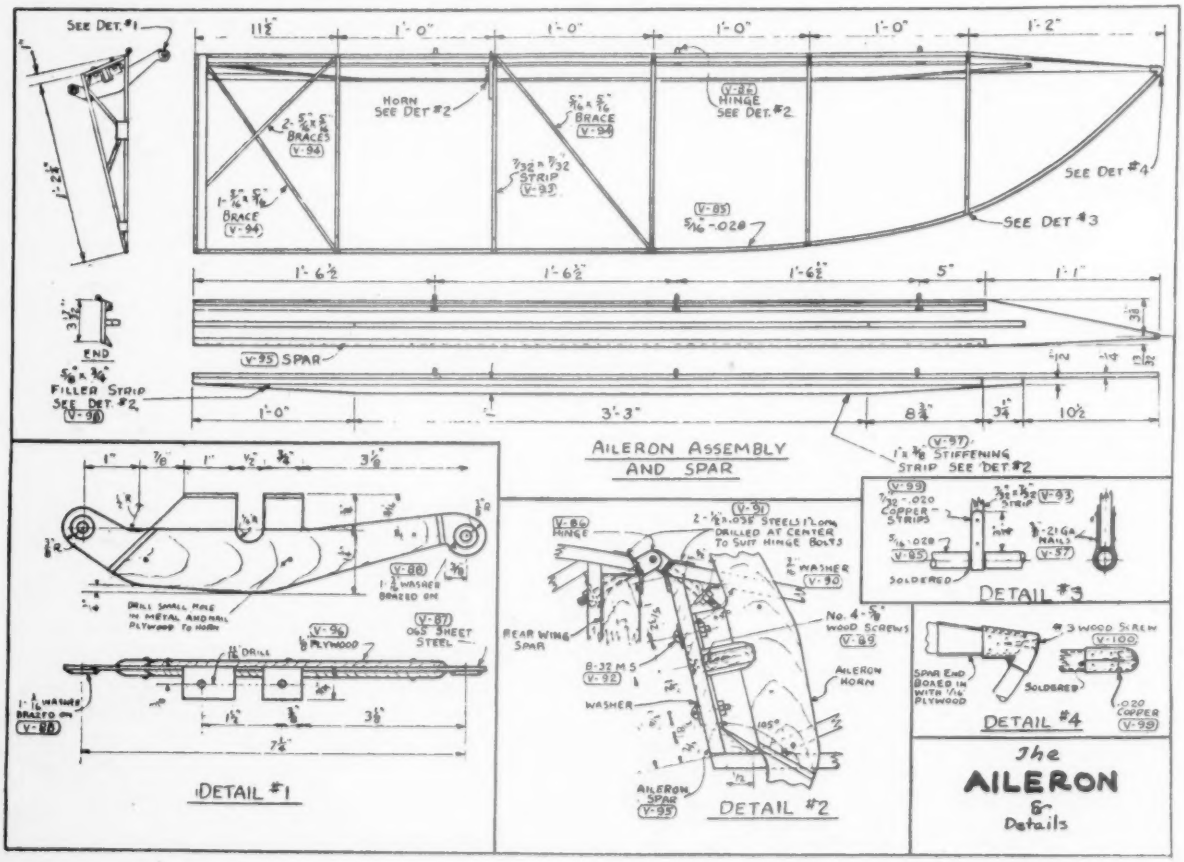
"Tinning" both surfaces to be soldered will hasten the soldering and insure a tight connection. When all soldering has been completed, and not before, wash all filings and foreign materials from the interior of the tank with gasoline. If water has gotten into the tank, wash out with alcohol.

Installing the Gas Tank

ROOM is made for the gas tank in the wing by cutting out three truss members of the rib next to the butt rib. The butt rib is removed, the tank put in place with the lugs hooked over the front spar and the butt rib is replaced.

The butt rib may now be made fast to the leading and trailing edges (V–71) and to both spars. Make three reinforcing posts (V–157) and nail and glue one to each of the three ribs supporting the gas tank, vertically beside the gas tank. Bolt the lugs shown

(*Continued on page 58*)



The Superstitions of a Pilot

(*Concluded from page* 18)

not even a bawling out from his instructor. This pilot reasoned that any time any instructor in flying of that day failed to bawl out a "kay-det" the ship must be full of luck, so he copped an engine bolt, and has carried it with him ever since.

Whether there is anything in these amulets or not, that boy has never cracked up a ship since, and that's a matter of record with one of the biggest passenger lines in the country.

Speaking of women reminds me of another popular superstition, and it's women. *Have you ever noticed the grief that a long cross-ocean or cross-country trip has where a woman is the second or third party in the group?*

I know my women readers will commence to snort when they get this far, but please control yourselves for a moment and go over several ocean trips, both on the Atlantic and Pacific, where women were in the party.

If you're fast you might name a couple of successful long hops where women were in the party, but these are just the exceptions that prove the question at hand. (Madame, if you throw that, I'll scream!) The author can hear several women saying, "Liar," "Crook," "Fabricator," and "Throw him out," but he's been called all those things, and then some, by experts, so don't get your noses red.

You can believe it or not, but I know several pilots who have thrown down good jobs because they would have had to chauffeur some women on the job.

The author will admit that superstition has no place in flying — absolutely and positively not. All that stuff should have been left in the dark ages along with other things we used to do, but, when you come right down to it, it's there, and what are you going to do about it?

I have flown around the country since 1915, and would welcome any suggestion as to how these superstitions could be removed from the Peelots (including one Chas. W. Purcell) without administering ether.

The Record Flight

(*Concluded from page* 27)

in his arms during the trip to the hospital. "Both he and I thought his neck was broken, and all he did was laugh and ask for a cigarette."

The accompanying illustration was sent to us by one of our readers, James McDonald. McDonald lives in Ancon, Canal Zone, and was right on the scene shortly after the accident occurred.

Readers!

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How to Build the Heath Parasol (*Continued from page* 56)

in detail #21 (V–152, and V–153) to the outside posts.

The front lugs are fastened to the spars with item V–151. From item V–150 make a small L shaped rib-stop and solder it to the top of the tank close to the rib as shown in detail #8 wing print.

Nail and glue pieces of ½"x⅜" spruce between the posts in the butt rib and the post in the rib adjoining, at the top and at the bottom and level with the rib surfaces. Between the butt rib and the rib adjoining, 8½" from the rear spar, another strip of ½"x⅜" spruce is mortised flush with the bottom rib surface of the right wing only. To this will be screwed a cover for the hand hole which gives access to the aileron cable take-up screw.

Bracing the wing may now be completed. Cut lengths of $\frac{1}{16}$" spruce (V–5, group #3, February issue of POPULAR AVIATION), and put double braces from the rear spar to the butt rib and from the rear spar to the seventh rib. Nail and glue these braces at both ends. (See wing print). Do not force or spring the braces into place. Run two braces, also, forward from the rear spar at the third rib to a point 8½" from the rear spar on the second rib.

Remove the small diagonal strut, just forward of the rear spar, from both butt ribs so that the aileron cable will have no interference. Reinforce the area by nailing and glueing a piece of spruce $\frac{1}{32}$"x⅝"x3" flat on the inside of both top and bottom cap stripping from the rear spar forward toward the first vertical strut in each butt rib.

Nail and glue a piece of $\frac{1}{16}$"x$\frac{1}{16}$" spruce on the bottom side of the rear spar at its inner edge between the butt rib and the second rib of the right wing. This makes the fourth side of the frame to which the hand hole cover will be screwed. If a sky light is to be built into the wing put a corresponding strip on the top side of the rear spar. Shape to the curve of the ribs.

Rigging the Aileron Cable

THE aileron balance cable, only, can be made at this time. Take item V–55 and at a point eleven feet three inches from one end, serve (wrap) with twelve turns of tinned wire (V–75). Cut through the served portion of the cable with a pair of tin snips. Make a loop in one end around a thimble (V–174) allowing the free end a length of 1¾".

Hold the loop closely around the thimble by placing the ends in a vise. Solder the ends side by side. Remove from the vise and serve the shank of the loop with thirty turns of wire in three groups of ten turns each, spaced ⅛" apart. Sweat solder through the serving wire to the cable. After serving a loop the entire end may be dipped into a solder pot instead of soldering with an iron.

Attach the aileron to the right wing and attach the looped end of the cable to the top aileron horn with a shackle (V–77) and a pin (V–78). Run the cable through the top pulley on the front spar and then through the take-up pulley on the rear spar. Put a thimble through the eye of the swivel snap (V–76) and bend a loop around the thimble, finishing as before,

Make the loop so that it will be six inches from the take-up pulley when the aileron is down. The cable for the other wing will be about ten inches shorter but should only be measured by butting the wings together and fastening them in that position while measuring. The balance cable should hold both ailerons level with the wing surfaces when the take-up screw is three quarters out.

After the cable is attached the take-up screw is adjusted by removing the pulley from its housing and screwing the assembly in or out. The cables which connect the bottom horn to the control stick cannot be completed at this time but you can make loops at each end of the remaining piece of cable. Store all unused material including the turnbuckles (V–38, V–39) for the aileron cable, the shut off cock (V–148) and the gas line (V–149).

The wings are now finished and all of the drag and anti-drag wires should be drawn up so that the wing is firmly square and the leading edges and the spars are straight. Take item V–79, slot both ends to receive the drift wires which pass above and below the gas tank and solder an end to each wire a short distance from the gas tank so that the wires will not drum or chafe on the tank. See detail #8 wing print.

The drift wires should be uniformly tight but should not be under too much tension. When the wing is true and square, "safety" all turn buckles with copper safety wire, running it through the hole in the barrel and up through the eye or slot in each end giving each wire end five or six turns around the end of the turnbuckle.

Clip off all portruding bolts and burr all threads so that no nuts will work loose. Give the gas tank a coat of red lead in oil, and give all wood in each wing panel a thorough protective coat of linseed oil or Heath's Preservative.

Store in some protected place and start on the Tail Assembly.

PART II

The Tail Assembly

NO ADDITIONAL tools are needed but the following materials will be required:

a. Stabilizer—

V–195. 6'2" ⅝"x22 ga. (.028) steel tubing (trailing edge).
V–196. 11 ft. ⅜"x22 ga. (.028) steel tubing (ribs and leading edge).
V–197. 3 ft. ¼"x22 ga. (.028) steel tubing (braces).
V–200. 4 No. 10 32x1½" machine screws and H. C. nuts.
V–202. 2 ft. $\frac{5}{16}$"x16 ga. (.065) steel tubing (reinforcing).
V–203. 2 yds. fabric (covering).
V–204. 2 ft. $\frac{1}{16}$"x22 ga. (.028) steel tubing (braces).
V–205. ½ sq. ft. terneplate (gussets).
V–206. 4 female hinges, nuts and pins.
V–207. 6"x¾"x18 ga. (.049) sheet steel (external brace fitting).

b. Fin—

V–220. 3 ft. $\frac{1}{16}$"x17 ga. (.058) steel tubing (trailing edge).
V–221. 14 in. ⅜"x22 ga. (.028) steel tubing (rib).
V–222. 27 in. $\frac{1}{16}$"x22 ga. (.028) steel tubing (leading edge).
V–223. 7 in. ¼"x22 ga. (.028) steel tubing (rib).
V–225. ½ yd. fabric (covering).
V–228. 2 female hinges, nuts and pins.
V–229. 6"x6" tern plate (gussets).
V–230. 6"x1½"x18 ga. (.049) sheet steel (external brace fitting).

c. Rudder—

V–245. 3 ft. ⅝"x22 ga. (.028) steel tubing (leading edge).
V–246. 20 in. ⅜"x22 ga. (.028) steel tubing (rib).
V–247. 17 in. $\frac{1}{16}$"x22 ga. (.028) steel tubing (rib).
V–248. 6 ft. ¼"x22 ga. (.028) steel tubing (rib and trailing edge).
V–249. 1 ft. $\frac{1}{16}$"x22 ga. (.028) steel tubing (braces).
V–250. 13"x3"x18 ga. (.049) sheet steel (horn).
V–251. 1 yd. fabric (covering).
V–252. 3 male hinges and nuts.
V–253. 8"x6" tern plate (gussets).

d. Elevators—

V–270. 6 ft. $\frac{5}{16}$"x22 ga. (.028) steel tube (leading edge).
V–271. 5 ft. 4 in. ⅜"x22 ga. (.028) steel tube (ribs).
V–272. 8 ft. 6 in. ¼"x22 ga. (.028) steel tube (trailing edge).
V–273. 27"x3"x18 ga. (.049) sheet steel (horns).
V–274. 2 yds. fabric covering.
V–275. 8"x6" tern plate (gussets).
V–276. 4 male hinges and nuts.

Procedure

THE tail group is of tubing soldered with gusset plate reinforcing. This type of construction when cleanly and carefully done is extremely simple and very strong. The preparation for soldering is a most important part. The surfaces to be soldered must be brightened with fine emery cloth and covered with a thin coat of soldering paste to prevent oxidation.

The soldering iron must be big enough to hold heat for a fair length of time (1 lb.). The surfaces are first independently "tinned." Hold the hot soldering iron hard against the tubing until it becomes hot enough for the solder to flow on and stick. When two "tinned" surfaces are held against each other with a hot iron the "tinning" runs together in a perfect joint.

The Stabilizer

DRAW a rectangle on the floor six feet by one foot. On one of the long sides which will be the rear edge, drive a nail one foot from each corner. Tie a piece of picture wire or other light wire to the nail, hold a piece of chalk against the wire one foot from the nail and so draw the two rounded corners of the stabilizer. Draw also the position of the internal bracing members according to your blue print.

Saw item V–195 to a length of 71½". Cut from item V–202, two lengths ten inches each. Insert one of these shorter pieces into each end of the long one (V–195) and drive inside until the nearest end is 14½" from the ends of the large tube. Lay this piece on your pattern at the rear edge and hold it in place by nailing wood blocks on either side. From V–196 saw a piece 86" long.

Bend carefully each end around an 8" or 10" pulley or wheel to get an even bend. If the bend is too small stretch open to fit your pattern. If wheels or pulleys are not available make the bend by tapping the tubing with a wooden mallet. This is the leading edge. Now taper both ends of the first piece by tapping with a hammer for a distance of 3" till they are ⅜" thick.

Take care that both flattened ends are in the same plane and groove them to a depth of ⅛" to receive the side of

(*Concluded on page* 62)

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XUM

An Airy Chat With the Editor

(*Concluded from page* 55)

It was originally taken by a German flyer who was later captured by the Allied forces. While a prisoner, the German was put to work test hopping captured German airplanes which were to be put in order and flown by Allied flyers.

The German prisoner gave this photo to our traveling acquaintance who was a member of an American flying squadron.

When we finally got a good look at the picture we found that it was unprintable. Too gruesome.

* * *

JOHN B. RATHBUN has already expressed his views in this issue about the lack of progress shown by present day aircraft. Mr. Rathbun, however, is willing to admit that progress has been shown in the matter of speed.

Robert W. Thomas, of New York City, isn't willing even to admit this. At least, as far as this country is concerned. His interesting comments follow:

"In a recent article, Captain Frank Hawks said that his plane, *Texaco No.* 13, travels at full throttle in excess of 240 miles per hour. In the same paragraph he stated that this plane 'is definitely in the category of high-speed airplanes.'

"After reading this statement, we are perhaps mildly surprised to note that in 1926 an Italian plane attained the speed of 246 miles per hour (Macchi M 39 piloted by Major de Bernardi), that in 1927 an English plane made 281 miles per hour (Supermarine Napier S 5 piloted by Flight-Lieutenant Webster), and that in 1929 another English plane established the world's air speed record of 357.7 miles per hour (Supermarine Rolls-Royce S 6 piloted by Squadron-Leader Orlebar).

"And here it is 1931, and one of the fastest (if not the fastest) planes now in America has a top speed only in excess of 240 miles per hour!

"It must be remembered that the above speeds were made by seaplanes. If the pontoons had been removed and wheels with streamlined pants, such as those on Captain Hawks' plane, had been substituted, the speeds would have been even greater.

"Many people will probably say that Captain Hawks' plane has a less powerful engine, has a larger cruising radius, and is more maneuverable than the planes mentioned above. All this is quite true, but low power engines, large cruising radii, and maneuverability do not contribute to speed; and Captain Hawks' statement was an assertion of the speed of his plane.

"So we can see that America's position in the field of speed planes is not a particularly brilliant one. America long ago put cowlings over radial engines and streamlined pants over landing wheels; yet it does not hold as prominent a place in airplane racing as some countries that are just now adopting these improvements for increasing the speed of planes.

"How much longer is America going to stand by and watch other countries build better and faster racing planes? America leads the world in commercial planes. Why can't we lead the world in speed planes? The research work and experimenting necessary to build fast racing planes will do more for our aeronautical engineers and aircraft manufacturers than merely winning races and establishing the world's speed records. Such work will give them experience and knowledge that will prove invaluable in the event of another war and at other times when exceptionally fast planes will be needed."

* * *

AS WE near the end of our column, we'll conduct an open market for our readers. Edward Rudolph, Greenvalley, Illinois, has a primary glider —"sturdy and successfully flown." Rudolph wishes to trade his glider in for a powered machine or sell it outright.

Joseph S. Brown, Cavetown, Md., wishes to buy a Heath Parasol or Lincoln Sport. The motor should be in fair condition but the ship itself can be in need of recovering or repairs. Price, $225.00.

Perhaps the above reader can get in touch with F. Kapel, 19209 St. Clair Ave., Cleveland, Ohio. Kapel owns a single place biplane in excellent condition. Newly recovered, fully equipped with instruments, 23 ft. upper span, weight 250 lbs. Ready to fly, less motor, the price is only $200.00.

* * *

AND now we have arrived at the end of our column.

Harry Wicklander—Glad you like our war stories. We like to read them ourselves.

Douglas G. Jeffrey—Thanks for the dope (Commander Jeffrey told us about information he has received from England that they expect to pass the 400 m.p.h. mark at the next Schneider Races).

How to Build a Backyard Trainer

(*Concluded from page* 44)

swing about at every change in the wind. The less friction at this point, the more sensitive the trainer will be and the greater will be the experience obtained with it.

The writer calls to mind a very elaborate trainer of this type that was built in Chicago. Instead of the simple cross sticks, this trainer had a fuselage and short stubby wings, so that it took on all the appearance of a real plane. Of course, the fuselage was very much less complicated than a real fuselage and the wings were not so delicate.

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MEAD GLIDERS

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How to Build the Heath Parasol (*Concluded from page* 58)

the ⅜" tubing which you have just shaped. If the tips of the tubing are grooved in this manner a better joint can be made than when the pieces are simply butted one against the other.

Place both pieces upon the pattern and nail cleats about the second piece also, to hold it in position. From the ⅜" tubing left make the two central and the two extreme braces shown in the print. Groove the ends to make a close fit. From V-197 make the two long diagonal braces on either side of the central braces and from V-204 make the two remaining members. Nail blocks to the floor so that they hold all of these braces in position.

From V-205 cut a number of gusset plates of truncated triangular shapes (about 1¼ square inches in area) and mould with a hammer to hug the tubing. Solder one at each joint, taking care that the pieces of tubing touch each other. At the junctures of the leading and trailing edges make the gussets in the form of straps and run them around the ends from one side to the other. Solder gusset plates to both sides of each joint.

Two 13/64" holes are drilled to the central braces near their ends at the leading edge. The centers of these holes should be ½" from the outside of the leading edge. Two 13/64" holes are drilled in the ⅝" rear edge near the points where the two central braces are soldered to it as shown in your print. A 13/64" hole is drilled in the leading edge ⅝" offset from the center point of the leading edge. To this will be bolted the lug at the foot of the Fin.

Reinforce the hole by soldering a piece of ternplate (V-205) about ⅜" x ⅝" over it. Reinforce the front side of the rear edge with pieces of ternplate ½" - ⅝" soldered at those points marked on your print for hinges. Drill at these points 13/64" holes and insert the hinges (V-206).

From V-207 make two clamp fittings to encircle the brace members third from the center. Make these by bending around a ¼" iron rod and squeezing the ends in a vise. Drill 13/64" holes in the ends. Slip them into place but do not fasten permanently until the ship is ready to be rigged.

The Fin

SAW V-220 to a length of 27". Taper one end for a distance of 4" to a thickness of 1/16" and saw off one corner of the flattened end to an angle of 40 degrees. From V-221, cut a piece 11¼" and groove both ends. From V-223 cut a piece 5¾" long. From V-222 cut a piece 24" long.

From your blue print draw a pattern of the fin upon the floor. Lay the tubing in place upon it and hold with cleats nailed to the floor. Note that there is a slight bow in the leading edge. This is proper. Solder together with gusset plates (V-229).

The gusset plate at the lower end of the leading edge is made from V-230 and should be shaped so that when in place the two sides will be turned up, enclosing the joint, and a lug or ear will project ¾" beyond the joint toward the front and in line with the lowest rib of the Fin. This lug will be bolted to the stabilizer on assembly. (See detail No. 8.)

At the places indicated for hinges on your print, reinforce with ternplate, drill a 13/64" hole and insert the hinges (V-228). Drill also a 13/64" hole in the mast or rear member of the Fin behind that point where the top rib joins it. This is for attaching the stabilizer braces. Mark and store the material for the braces (V-226) and put the bolts (V-227) into their holes for safekeeping.

The Elevators

MAKE a pattern by drawing on the floor a straight line 32" long. Mark a center point. From the center point ½" each way on the line, drive nails. Using a wire and a piece of chalk, describe the rounded trailing edge of the elevator, using the nails as centers. The radius is 15". Draw the right half of the curve from the right-hand nail, and the left half from the left-hand nail.

From V-270 cut a piece 31¾" long. Taper both ends in the same plane for a distance of 4", to a thickness of ¼" and groove each end. From V-272 saw a 48½" length. Bend by tapping with a wooden mallet to a shape to fit your pattern. Hold in place with cleats. Make two braces from V-271 and locate according to your print. Solder together with gusset plates (V-275).

At the points marked on your print for hinges reinforce with ½" x ⅝" tern plate. Drill 13/64" holes and insert the hinges (V-276). Check the hinge positions with the stabilizer hinges.

From V-273, with a metal cutting coping saw cut four flat shapes as shown in your drawing of the horn. Place one pair of these just inside the forward tubing and enclosing the front end of the rib indicated on the print. Drill through the horns and the rib tubing with a 3/32" drill and pin together with two No. 12½ wire nails. Clip off the excess nail. Solder to the tubing. Press the ends flat together for a distance of ⅝" and solder. Drill a 3/16" hole in each end centered 1/16" from the ends.

Make two elevators and note the slight difference of position of the internal braces which identify the side of the elevator that will be nearest the rudder. The horns belong on the brace closest to the rudder. One pattern can be used for both elevators.

The Rudder

IN MAKING the rudder pattern it will be easier to draw the irregular outline of the trailing edge if the same method is used as that by which you laid out the curved wing tip. Draw a straight line 35⅝" long and use this line as a base from which all your measurements will be laid. Mark off the straight portion of the rudder forward edge on this line. Make all other measurements from this line to the curved portion at 3" intervals along this line and at right angles to it.

From V-245 cut a 32" length, taper each end for 4" to a thickness of ¼". Saw a 10" piece from V-248 and bend the remainder to the shape of the trailing edge in your pattern. File the ends of the leading end trailing edges so that they fit closely together. Hold in position with cleats.

Fit the 10" piece in its place near the small curve or top of the rudder. From V-247 make the brace second from the top. From V-246 make the long brace and from V-249 make the short diagonal brace. Solder together with gusset plates (V-275) except for the short diagonal brace.

From V-250 make horns as before. Pin to the sides of the long brace just inside the leading edge and solder in place. Flatten and solder the ends together. Solder the short diagonal brace in position.

Locate the hinge points, reinforce with tern plate and drill with 13/64" holes. Insert the hinges (V-276). The lowest hinge is mated to one on the fuselage stern post, but the other two must be checked against the hinges on the Fin.

This completes the tail group except for covering, which will be done just before the final assembly. Paint the various frames with a metal primer, hang where they will not become damaged and mark and store the unused fabric, machine screws, brace tubing and the hinge pins.

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A Skirmish with Rebels

(*Concluded from page* 12)

entirely, but I finally succeeded in nursing the sick engine to our advanced airdrome at Ocotal.

Later I found what was wrong with my plane. A horse-fly had become lodged under the needle valve in the carburetor. Just a common horse-fly, but he had almost brought the commander of the Nicaraguan air force down, and at a time and place where a forced landing would have meant certain death.

Aviation Stands Still

(*Concluded from page* 22)

There are two innovations of merit on many of the planes, I confess. No. 1 is the metal propeller and No. 2 is the occasional application of the slotted wing. Slotted wings are not strictly a modern stunt, but to avoid argument we will pass this point up.

The monoplane fever is with us but for how long? If the ship is to be strictly a stable flier with some slight sacrifices in the way of head resistance, then it is likely that there will be a revival of the biplane and triplane since the latter types are more easily made stable than the monoplane, at least to judge from present indications.

Taking a look around the fuselage reveals no alarming improvements. Before 1930 we had expected to find molded shells or their equivalent, but evidently we have been too optimistic. In many cases the old control wires have been thrown out in favor of rigid tube controls—good enough—but still we find the old control system in vogue that was standardized during the war and which should have gone the way of all similar misfits and adaptations.

It is some improvement over the old wrist twisters on the Wright Model "B," but not so much at that. Just so long as the pilot must stabilize the ship in addition to his other duties we must expect some sort of complications in the controls. Let us hope that the ship of 1932 will possess inherent stability to that degree where the chief function of the manual controls will be to steer from right to left and up and down.

With all the chance in the world for improvements in the controls and for automatic stability, the modern ship remains difficult to control and unstable. It still requires long training to master the ship, and the whole matter of flight savors largely of an acrobatic performance.

Modern ships are so safe and reliable that the intending flyer must go through a long, expensive, preliminary training before he takes over the controls. And the whole scheme of things is then tied up in the red tape incident to pilot's licenses and similar restrictions.

In days to come, if they ever come, the salesman will take the customer out in a clear space, show him how to steer and how to manipulate the throttle, two or three trial flights and the training will be over. It will be no more difficult or involved than teaching a customer how to operate an automobile.

Instead of going through a course of gymnastics and physical examinations, to say nothing of learning welding, carpentry and engine repair work, the customer will simply sign a check, hop in and then shove off.

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Just devote about an hour a day to my Home Training Course, and in a few short months you can master the principles of Ground Training, which are necessary before you take your place in any branch of Aviation. In a few short months I will give you practical aviation training and prepare you for one of the better pay jobs open to men thoroughly trained in Aviation.

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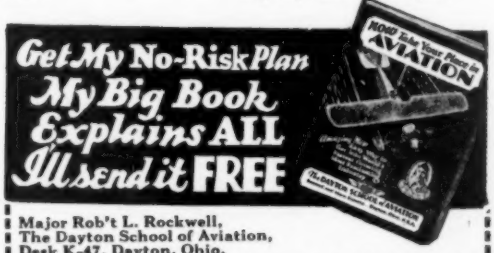

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Dear Major: Please send me FREE and without obligation a copy of your famous book on Aviation; and Free Airplane offer.

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A Lesson in Aircraft Instruments

(*Concluded from page* 30)

Ground-Speed Meter

A Ground-Speed Meter is usually combined with the drift indicator, and as it measures off the distance traveled from two given points on the earth, the altitude of the plane over the ground must also be used in the calculation. The eye forms one corner of an imaginary triangle while the "altitude" or height of the plane above the earth forms one side. The two cross-hairs seen by the eye now form the base of the triangle, and by means of a watch some fixed point on the earth is timed between the cross-hairs. This gives the ground-speed by the principle of triangulation.

Clock

We also have a clock on the more complete machines, but even the clock has changed somewhat since its adaption to the airplane. The airplane clock of the latest pattern has two sets of hands, one set of red hands set by a knob when the flight is started, and one pair of black hands driven by the works in the usual way. The difference between the two sets of hands, of course, gives the elapsed flying time from start to finish of the flight. The clocks may either be of the spring-driven type on the new electric type found in many up-to-date automobiles.

Rate-of-Climb Meter

The last of the instruments used for navigation is the Rate-of-Climb Meter that indicates how fast the ship is climbing in feet per minute. This instrument is not usually included on the simpler ships but is a very useful instrument, particularly for blind flying or night work. Again, the Rate-of-Climb Meter is a good check on the engine and its condition.

Band-and-Turn Indicator

Of the operating instruments, the Bank-and-Turn Indicator is the most commonly encountered on all classes of planes. It indicates whether the wings are banked up to the proper degree on a turn, and hence whether the ship is turning normally or whether it is side-slipping or skidding. There are different types, some employing a pendulum for indicating the angle, some employ a spirit level bubble while others employ the method of differential pressure.

In the latter type we have a revised pressure gauge with a central diaphragm and tubes leading to both sides of the body from either side of the diaphragm. So long as the air pressure is balanced on both sides of the body, the needle remains in "neutral," showing that the ship is neither side-slipping nor skidding. If, however, the ship skids or slips to one side, a sudden blast of air on that side will move the needle to indicate the side on which the skid or slip is taking place. While this instrument is seldom used on open cockpit machines, it is almost indispensable with cabin planes or student planes.

Blown to Pieces

(*Concluded from page* 26)

Desperately I twisted about, then grasped and pulled the shroud lines on one side with all of my strength. My frantic efforts to raise myself upward partially closed the parachute, drawing it together at the bottom so that it slipped sideways. Several of the fire spots burned out.

Panic seized me—searing, heart-rending panic.

I groaned and changed my grip to the other shrouds. I gritted my teeth and pulled, then the 'chute swung in the opposite direction.

Again I grabbed and jerked at other shrouds — then the earth hit me.

* * * *

Several hours later, I was still in a doze when I left the studio's emergency hospital. I was spotted with bandages, patches of adhesive tape, and smelly with ointment, but the thing which dazzled was the five thousand-dollar check I held in a bandaged hand.

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DOPE, $1.50 gal., Thinner, $1.50 gal Pinked tape, 3c yd., Rib Cord $3 lb., Long Needles, 25c, Curved Needles, 25c, ¼ in. x ¼ in. Spruce strips, 500 ft., $5.00. 1/24 in. to ⅛ in. plywood, 25c sq. ft.

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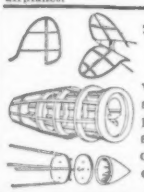

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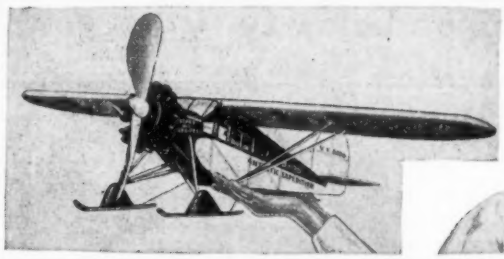

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South Pole Model Ski-Equipped to Rise Off Snow

3 Models in 1

Watch the gang sit up and take notice when you bring out this eye-arresting "Stars and Stripes" 2-foot black and orange scale-type model ski-equipped to rise off snow, just like Byrd did at the South Pole. When flying conditions change, put on pontoons or wheels. Thrilling fun to set wing forward, release model to zoom up and over on her back, then watch the dihedral automatically roll her over to right side up position, like some crack army pilot doing an Immelmann turn. Launch down and cross wind with wing in stalling position, this model makes a climbing turn out of the field for altitude of 50 to 75 feet, then levels off to "go places and do things." As you gain in experience, other air stunts will come to you that make flying this Fairchild 71 the most thrilling of all individual sports.

Model construction follows closely that of original plane, using balsa longerons and diagonal bracing, cellophane windows, workable doors, Wright Whirlwind motor, and like the real Fairchild, wings fold back for easy storage. Even Byrd insignia and license numbers furnished. From all over Canada and the United States come volunteer statements from model builders that this Fairchild 71 not only looks better, flies better but, is the BEST MODEL AIRPLANE VALUE on the market. Not just one model, but a seaplane, landplane and snowplane, 3 MODELS for the price of one. The only Byrd "Stars and Stripes" offered model builders, so get your order in today. Span—24 in. Chord—3⅝ in. Length—17½ in. Weight ¾ oz. Selected balsa framing readicut, cement, dope, wire fittings formed, stamped ribs, black and orange tissue, rubber motor, all Byrd insignia, celluloid wheels, materials for motor dummy, complete directions and drawings to simplify construction, all complete in stout mailing tube. A $5 value sold direct from factory to you, Canada and west of Denver postpaid $2.20. Balance U. S. postpaid

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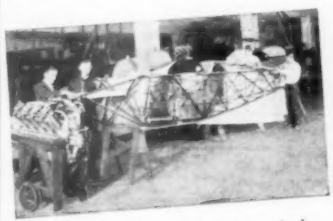

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